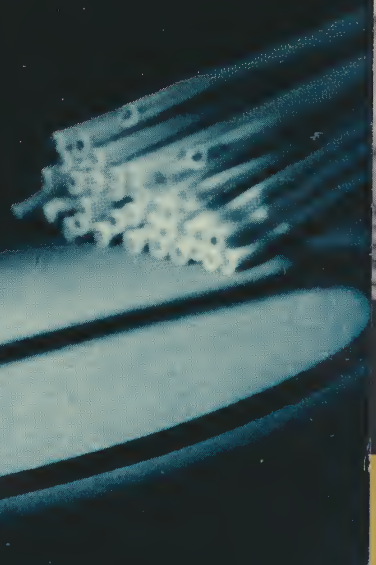


THE *TY-RAP* SYSTEM OF RELIABILITY FOR CABLING AND HARNESSING



**TY-RAP™**



Pub. 100.1



**THOMAS & BETTS**

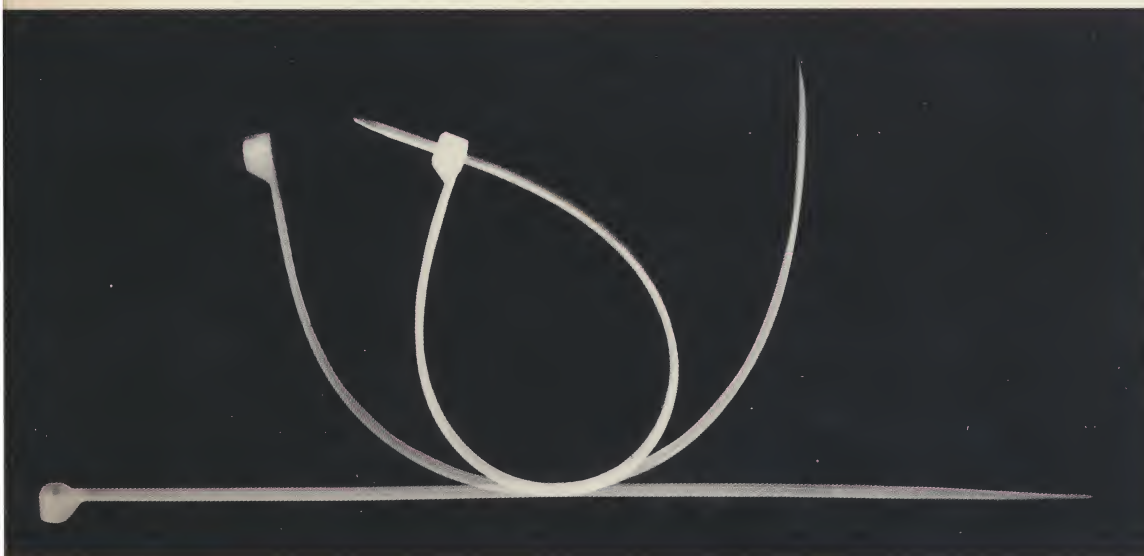
# THE *TY-RAP*<sup>TM</sup> METHOD

Harnessing and point-to-point wire bundling have been an integral part of modern electrical and electronic packaging. The need to accomplish harnessing and bundling as economically as possible has led to the development of various techniques. The most advanced technique, accepted throughout industry, is the *TY-RAP* Method originated by Thomas & Betts.

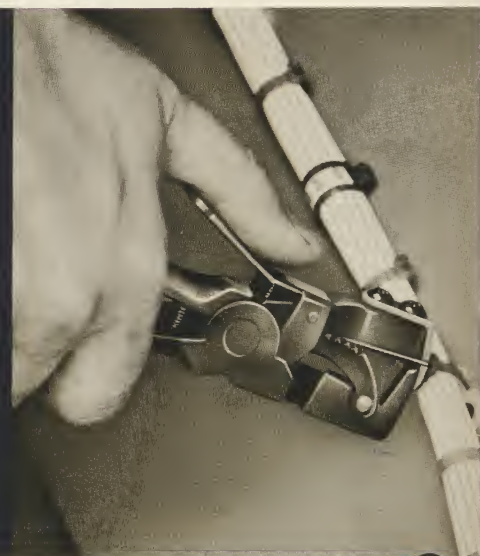
The *TY-RAP* Method, based on the initial concept of providing the maximum integrity for each individual tie, has expanded into a broad practical system covering all phases of tying, clamping, mounting, identification, and pre-fabrication of harnesses and bundles.

A number of distinct advantages over other techniques are gained by using the *TY-RAP* Method. Close examination of this method reveals these facts:

- With five or ten minutes training time, your operator can produce ties that are superior in uniformity of tightness, in appearance, in strength, and in over-all quality to those of an expert who needed several years experience to become proficient in tying. This takes the "art" out of tying — minimizing the human factor.



TYING



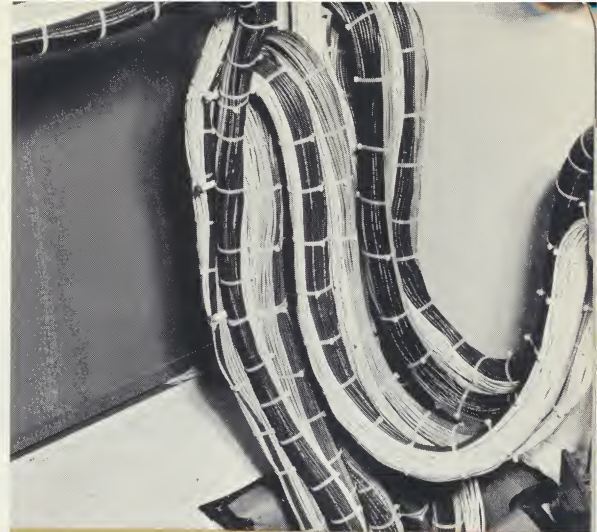
TOOLS



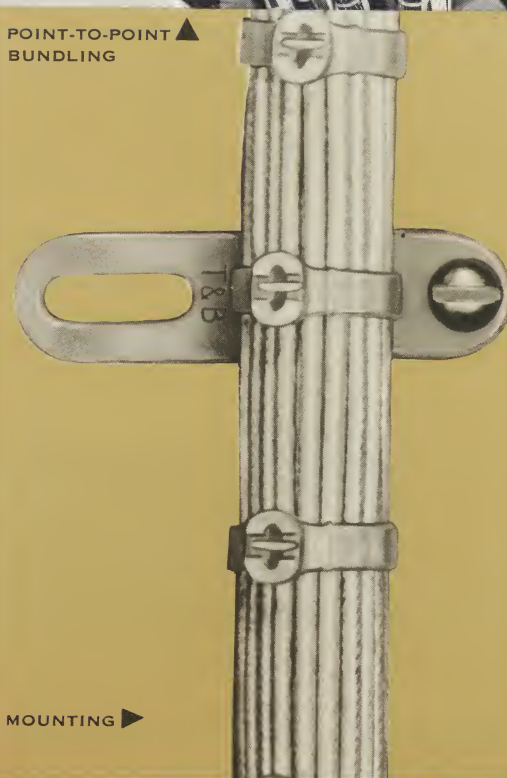
- *TY-RAP* ties can be applied in half the time that a string tie can — and because of controlled tying tension and wider gripping surface, fewer ties are needed.
- Made of DuPont Zytel† 101 (nylon), *TY-RAP* ties are smooth and easy on hands. Operators no longer need to suffer bruises, cuts and callouses when tying.
- Easy-to-use tools give you the same quality and tightness in each tie, whereas with other methods, uniform control of the knot or tie is impossible.
- Just a glance is all that's necessary when inspecting *TY-RAP* ties— the quality of the tie is immediately obvious.
- Two convex ribs molded on the *TY-RAP* ties keep them in place on the cable. Slipping of ties and bunching together is not possible, as with string tying and lacing techniques.

As you read on, you'll see how the *TY-RAP* method works for you. See how it speeds and improves tying, clamping, mounting, identifying, and color coding. See how it improves your cabling and harnessing while saving you money. See how some manufacturers have saved up to \$250,000 on a single program with the *TY-RAP* Method!

†Reg. TM of Dupont



POINT-TO-POINT  
BUNDLING ▲



MOUNTING ►

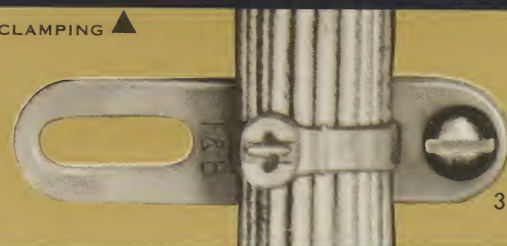


IDENTIFYING

HARNESSING



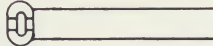



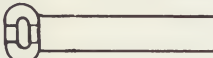
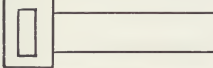
CLAMPING ▲






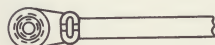


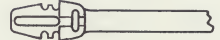

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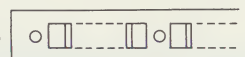
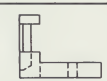






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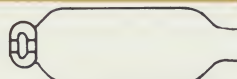
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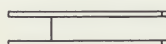
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# TWIST-LOCKING TY-RAP™ TIES FOR PRODUCTION

Patented

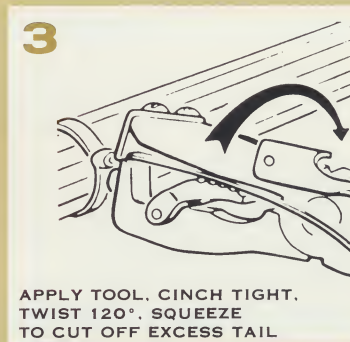
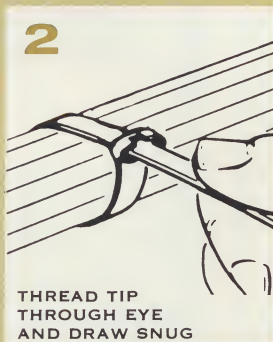
*TY-RAP* ties can be used for tying cables and bundles ranging in size from  $\frac{1}{16}$ " to 4" diameter. Molded of DuPont Zytel 101, they are smooth, strong, easy on hands, and can be obtained in a variety of colors for coding purposes. Specially designed convex ribs, molded on the one-piece *TY-RAP* ties, keep them in place on the cable, thereby preventing lateral movement. Because all edges are rounded, the ties are completely stress relieved. Additionally, a variety of manual or pneumatic tools, designed to eliminate operator fatigue, assist your operator in making perfect ties every time.

*TY-RAP* ties are also available in materials such as Penton\*, Zytel†37, and stainless steel for special or unusual applications. See page 13.

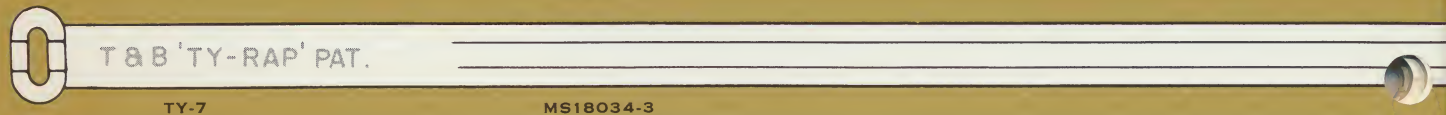
For production applications, the Twist-Locking *TY-RAP* tie, used in conjunction with one of the scientifically designed *TY-RAP* tools, provides lowest installed cost. Installation is easy . . . just slip tie around bundle, thread tip through eye, draw snug, twist, and cutoff with tool. You'll be pleased with the ease of threading (just a slight pull is all that is necessary) and with the slight effort required to accomplish a perfect tie. Excellent pullout resistance is obtained by use of the Twist-Lock tie — from 18 lbs. for the TY-3 to over 120 lbs. for the TY-7, thus exceeding the requirement of MIL S-23190A.

The tie can be made even faster and with less effort if you use one of T&B's pneumatic tools which performs the tensioning, twisting, and cutting operations automatically.

**INSTALLATION  
IS FAST  
AND EASY**



\*Reg. TM of Hercules Powder Co.  
†Reg. TM of DuPont





POINT-TO-POINT BUNDLING  
WITH TY-RAP TIES  
IS NEAT, EFFICIENT

## **TWIST-LOCKING TY-RAP TIES**



CAT. NO.	WIRE BUNDLE RANGE	MINIMUM TENSILE UNLOCKING STRENGTH MIL-S-23190A (WEP)	WIDTH	LENGTH	INSTALLING TOOL
TY-3	1/16" to 5/8"	18 lbs.	.091"	3.62"	WT-185F WT-293 TR-3000
TY-5	1/16" to 1-3/4"	50 lbs.	.184"	7.31"	WT-183F TR-5000 WT-185F WT-295
TY-7	3/16" to 3-1/2"	120 lbs.	.301"	13.30"	WT-186F
TY-8	1/16" to 4"	50 lbs.	.184"	14.19"	WT-183F TR-5000 WT-185F WT-295

### **MILITARY SPECIFICATIONS**

*TY-RAP* meets MIL-S-23190A (WEP) dated 16 March 1964 which specifically covers nylon cable ties. Applicable Military Standards drawing numbers are shown next to *TY-RAP* drawing. See below left (page 6).

### **SPECIAL TY-RAP TIES**

If necessary, T&B can produce specially-designed ties for your particular requirements. Contact your local T&B representative for more information.

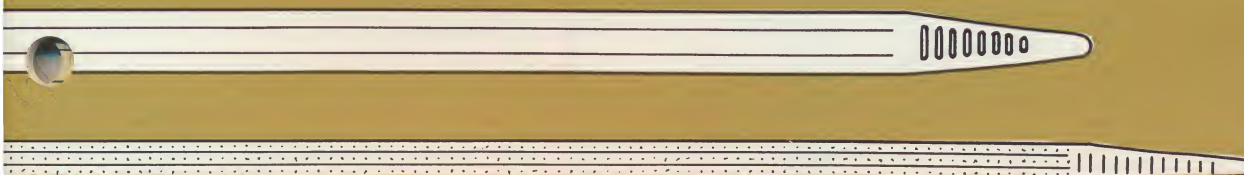
### **HOW TO ORDER COLOR CODED**

Natural Nylon (white) is standard and will be shipped if no other color is specified. Should you need colored *TY-RAP* ties, add the following dash numbers to *TY-RAP* tie Catalog numbers.

See page 13 for outdoor type.

COLOR	DASH NO.	COLOR	DASH NO.
Black	— 0	Green	— 5
Brown	— 1	Blue	— 6
Red	— 2	Purple	— 7
Orange	— 3	Gray	— 8
Yellow	— 4		
Example: TY-5-2 would be a red TY-5			

Tool Installed ties — see dimensional information above.





# TWIST-LOCKING INSTALLING TOOLS

Patented and Patents Pending

With the manual Twist-Locking tool, the *TY-RAP* tie is pulled tight, locked, and snipped off in a clean, simple operation. A thumb-operated safety release controls cut off of excess tail after the tie has been brought to the required tension.

For high speed tying and major production work, the air operated tool is preferred. Light and sturdy, it installs the tie in a single, quick operation. Further, the tension of the tie may be adjusted by the air regulator furnished with the tool.

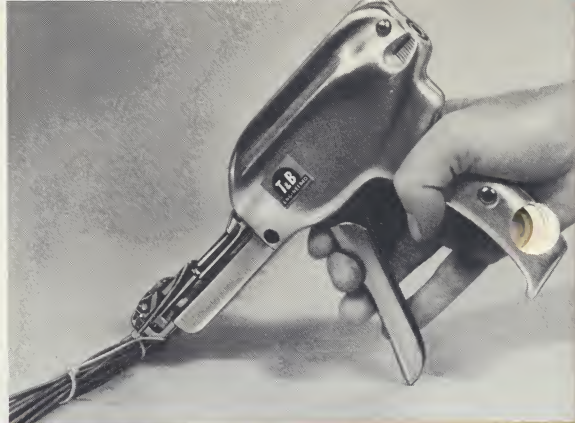
Both the manual and automatic tools are so easy to operate that their use in applying just a few ties is all the training required for your operator.

## HAND OPERATED TOOLS

CAT. NO.	INSTALLS	ACCEPTS THESE TY-RAP TIE WIDTHS	REMARKS
WT-183F	TY-5, TY-8, TY-15, TY-42 TY-42D	.184"	Has thumb-operated cutoff release so operator can control cutoff.
WT-185F	TY-3, TY-5, TY-8, TY-13 TY-15, TY-42, TY-42D	Up to .184"	Has thumb-operated cutoff release.
WT-186F	TY-7, TY-17	.301"	Does not require cut-off release due to the larger size of the tie.
WT-293	TY-3, TY-13	.091"	Automatically tensions, twists, and cuts off tail.
WT-295	TY-5, TY-8, TY-15, TY-42	.184"	Automatically tensions, twists, and cuts off tail.

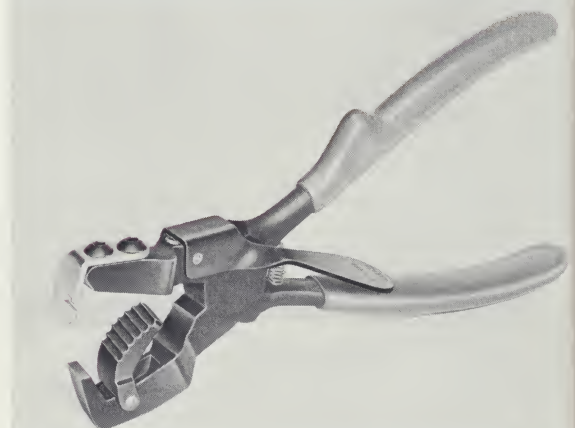
## AIR-OPERATED POWER TOOLS

CAT. NO.	INSTALLS	ACCEPTS THESE TY-RAP TIE WIDTHS	REMARKS
TR-3000	TY-3, TY-13	.091"	Automatically tensions, twists and cuts off tail.
TR-5000	TY-5, TY-8, TY-15, TY-42, TY-42D	.184"	Automatically tensions, twists and cuts off tail.

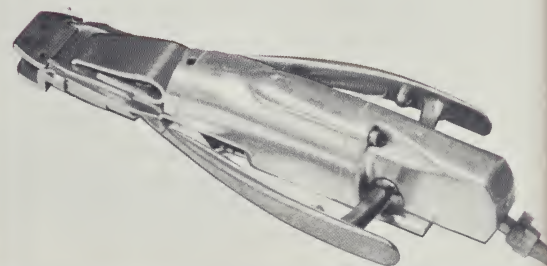


**WT-295 INSTALLING TOOL**

**WT-183F INSTALLING TOOL**



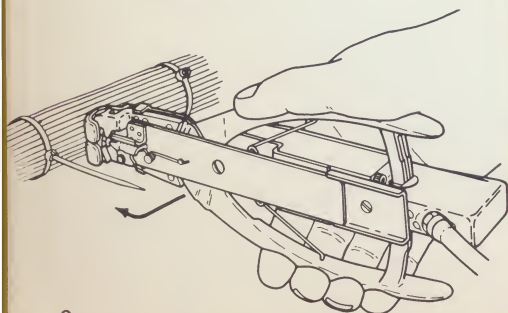
**TR-5000 INSTALLING TOOL**



## SEQUENCE OF DRAWINGS ILLUSTRATES USE OF TR-5000 FOR TYING

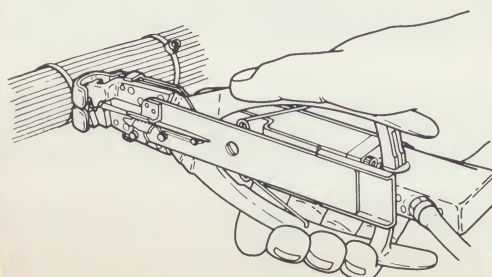
**1**

ENGAGE THE POWER TOOL ON THE TY-RAP TIE CLOSE TO THE BUNDLE TO INSURE PROPER TENSIONING OF THE TIE.



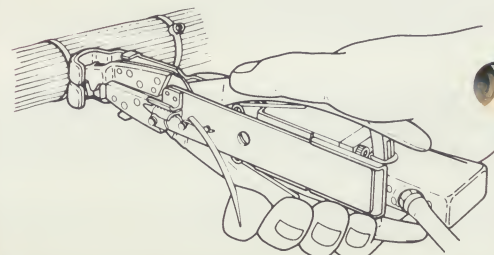
**2**

CLOSE THE HANDLES TO STOP POSITION AND HOLD MOMENTARILY (ABOUT HALF A SECOND). THE TOOL WILL TIGHTEN THE TY-RAP TIE ON THE BUNDLE.



**3**

CLOSE THE HANDLES ALL THE WAY. THE POWER TOOL WILL TWIST THE TY-RAP TIE, CUT IT, AND EJECT THE UNUSED PORTION.

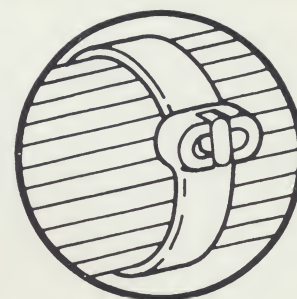




# RELIABILITY OF THE TWIST-LOCK TY-RAP™ TIES

Twist-lock *TY-RAP* ties, Ty-3, 5, 7, and 8 will qualify as Type I Class I Straps under Military Specification MIL-S-23190A (WEP). The Twist-Locking tie is designed for easy installation — and the high reliability of the tie is easily inspected.

Refer to the illustration which shows an end view of the TY-RAP tie which was installed properly. Note that the tail has twisted 90°, and is firmly locked in the notch in the head.



END VIEW OF TIE — DEMONSTRATING EASE OF INSPECTION

**MECHANICAL TESTING OF TY-RAP TIES** The results of some of the mechanical tests performed on Twist-Locking *TY-RAP* ties are tabulated on this page. The tests were conducted in accordance with Military Specification MIL-S-23190A (WEP) for qualification as Type I Class I Straps.

## TENSILE STRENGTH TEST

	TY-5		TY-7	
SAMPLE NUMBER	ACTUAL TENSILE STRENGTH VALUES (LBS.)	TENSILE STRENGTH REQUIRED (LBS.) PER MIL-S-23190A (WEP)	ACTUAL TENSILE STRENGTH VALUES (LBS.)	TENSILE STRENGTH REQUIRED (LBS.) PER MIL-S-23190A (WEP)
1	109	50	152	120
2	103	50	168	120
3	104	50	169	120
4	100	50	167	120
5	101	50	173	120
6	107	50	164	120
7	105	50	137	120
8	103	50	181	120
9	108	50	183	120
10	101	50	125	120
11	96	50	164	120
12	100	50	181	120
13	100	50	169	120
14	103	50	127	120
15	100	50	177	120
16	101	50	165	120
17	100	50	153	120
18	106	50	169	120
19	90	50	164	120
20	99	50	144	120

## LIFE TEST\*

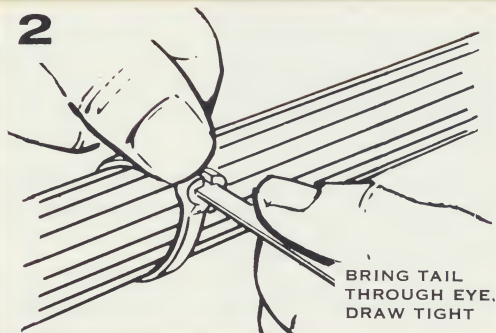
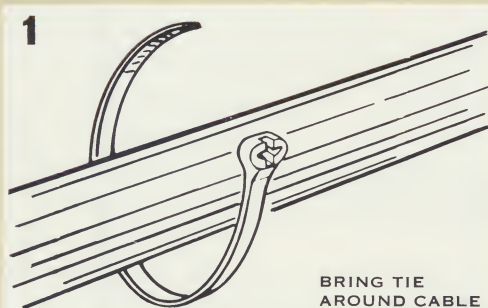
	TY-5		TY-7	
SAMPLE NUMBER	ACTUAL TENSILE STRENGTH VALUES (LBS.)	TENSILE STRENGTH REQUIRED (LBS.) PER MIL-S-23190A (WEP)	ACTUAL TENSILE STRENGTH VALUES (LBS.)	TENSILE STRENGTH REQUIRED (LBS.) PER MIL-S-23190A (WEP)
1	65	50	176	120
2	77	50	208	120
3	86	50	144	120
4	86	50	203	120
5	75	50	188	120
6	84	50	185	120
7	77	50	197	120
8	84	50	187	120
9	99	50	159	120
10	90	50	202	120

\*Life Test — Conducted in accordance with MIL-S-23190A (WEP). Cable straps are subjected to extremes of heat and cold, and then tested for tensile strength.

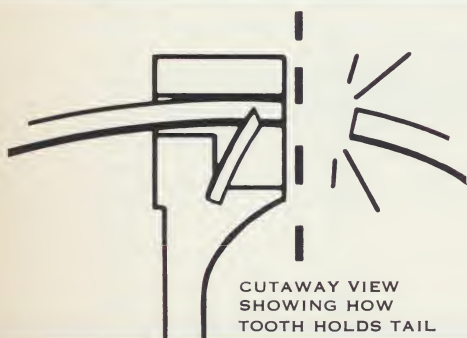
# SELF-LOCKING TY-RAP™ TIES

Patents Pending

**INSTALLATION  
IS FAST  
AND EASY**



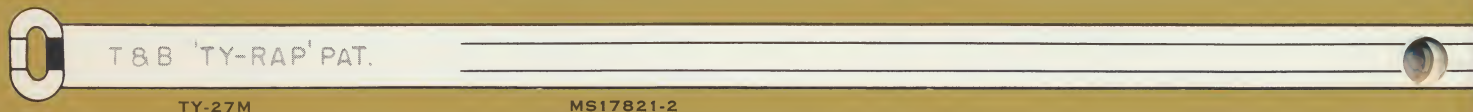
CUTAWAY VIEW  
SHOWING TOOTH IN HEAD



CUTAWAY VIEW  
SHOWING HOW  
TOOTH HOLDS TAIL

Self-Locking *TY-RAP* ties are designed for rugged field and shop applications. A stainless steel tooth mounted in the eye locks the tie at any desired diameter. Installation is quick . . . simply slip *TY-RAP* around bundle, thread tip through eye, draw tight, and cut off.

All of the Self-Locking *TY-RAP* ties exceed the minimum pull-out strength requirements specified in MIL-S-23190A (WEP). No tools are needed to install the Self-Locking ties. However, additional speed and convenience can be gained by using an appropriate *TY-RAP* tool if you are installing large quantities of ties. Refer to Page 12 for a description of these tools.





**SELF-LOCKING TY-RAP TIES**

CAT. NO.	WIRE BUNDLE RANGE	MINIMUM TENSILE UNLOCKING STRENGTH MIL-S-23190A (WEP)	WIDTH	LENGTH	INSTALLING TOOL
TY-23M	1/16" to 5/8"	18 lbs.	.091"	3.62"	WT-195F, WT-199
TY-25M	1/16" to 1-3/4"	50 lbs.	.184"	7.31"	WT-195F, WT-199
TY-27M	3/16" to 3-1/2"	120 lbs.	.301"	13.38"	WT-196F
TY-28M	1/16" to 4"	50 lbs.	.184"	14.19"	WT-195F, WT-199



**MILITARY SPECIFICATIONS**

*TY-RAP* meets MIL-S-23190A (WEP) dated 16 March 1964 which specifically covers nylon cable ties. Applicable Military Standards drawing numbers are shown next to *TY-RAP* drawing.

**SPECIAL TY-RAP TIES**

If necessary, T&B can produce specially-designed ties for your particular requirements. Contact your local T&B representative for more information.

**HOW TO ORDER COLOR CODED TY-RAP TIES**

Natural Nylon (white) is standard and will be shipped if no other color is specified. Should you need colored *TY-RAP* ties, add the following dash numbers to *TY-RAP* tie Catalog numbers.

COLOR	DASH NO.	COLOR	DASH NO.
Black	— 0	Green	— 5
Brown	— 1	Blue	— 6
Red	— 2	Purple	— 7
Orange	— 3	Gray	— 8
Yellow	— 4		

Example : —  
TY-23M-0 would be a black TY-23M

See page 13 for outdoor type.

Self-Locking ties — see dimensional information above.

# SELF-LOCKING TY-RAP™ TIE INSTALLING TOOLS

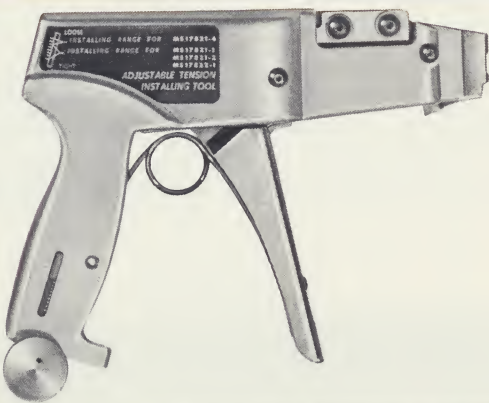
Patented and Patents Pending

Either manual or air-operated tools may be selected for tying Self-Locking TY-RAP ties. The WT-199, a pistol-type tool which installs most of the Self-Locking ties, has an easily adjustable tension control that enables the operator to suit each tie exactly to the type of cable, cable insulation, and cable diameter involved. The WT-195 F hand tool conforms to MS-17823-2.

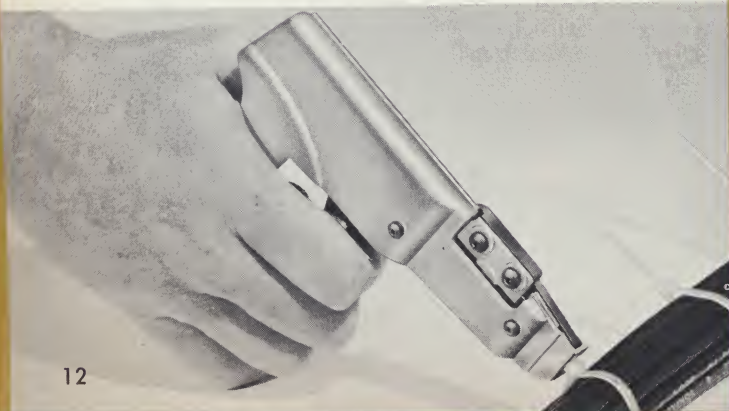
## SELF-LOCKING TY-RAP INSTALLING TOOLS

CAT. NO.	INSTALLS	REMARKS
WT-195F	TY-23M, TY-25M, TY-28M, TY-35M, TY-46M	Has thumb-operated cutoff release so that operator cannot cutoff tail prematurely.
WT-196F	TY-27M	Does not require thumb-operated cutoff release.
WT-199	TY-23M, TY-25M, TY-28M, TY-35M, TY-46M	Pistol-type, easily adjustable tension adjustment. Cuts off tail.

WT-199 PISTOL-TYPE INSTALLING TOOL



WT-195F INSTALLING TOOL





# ENVIRONMENTAL TY-RAP™ TIES

**PENTON\* TY-RAP TIES** Originally developed for use in the Titan II and Titan III missiles, Penton TY-RAP ties are light weight, resistant to corrosive chemicals such as nitrogen tetroxide (a rocket fuel), dimensionally stable, and are strong. Green in color, they are available in the same sizes as standard TY-RAP ties, both Twist-Locking and Self-Locking types. They will accommodate bundle diameters from 1/16" to 4".

**ZYTEL† 37 TY-RAP TIES** Designed for applications involving continuous exposure to sunlight, black-carbon filled Zytel 37 TY-RAP ties continue to keep their holding power under these extreme conditions. Similar in dimensions to standard TY-RAP ties, they may be obtained in either Twist-Locking or Self-Locking styles for bundle diameters up to 4".

**STAINLESS STEEL TY-RAP TIES** Stainless steel TY-RAP ties withstand temperatures up to 1200°F without loss of holding strength. When installing them, they can be inserted in a length of high temperature tubing to protect cable insulation. Next, the tie is placed around the cable, the tip is threaded through the eye, and the tip is rolled up with a pair of needle-nose pliers.

\*Reg. TM of Hercules Powder Co.

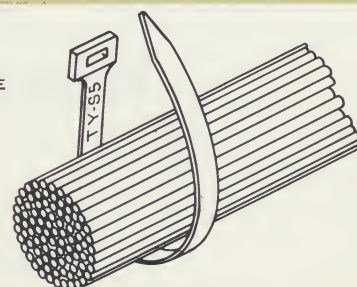
†Reg. TM of DuPont



## INSTALLATION OF STAINLESS STEEL TIES

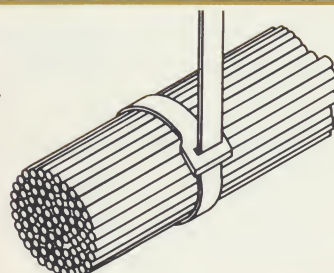
**1**

BRING TIE AROUND CABLE



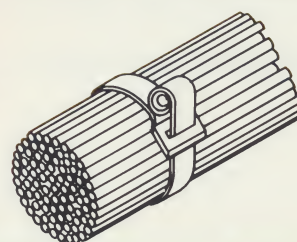
**2**

DRAW TIP THROUGH EYE



**3**

ROLL-UP TIE WITH PLIERS



## ENVIRONMENTAL TY-RAP TIES

CAT. NO.	MATERIAL	TYING METHOD	BUNDLE RANGE	MINIMUM TENSILE UNLOCKING STRENGTH	WIDTH	LENGTH	INSTALLING TOOL
TY-P3	Penton	Twist	1/16" to 5/8"	15 lbs.	.091"	3.62"	WT-185F, WT-293 TR-3000
TY-P5	Penton	Twist	1/16" to 1-3/4"	25 lbs.	.184"	7.31"	WT-183F, WT-295 WT-185F, TR-5000
TY-P7	Penton	Twist	3/16" to 3-1/2"	60 lbs.	.301"	13.30"	WT-186F
TY-P8	Penton	Twist	1/16" to 4"	25 lbs.	.184"	14.19"	WT-183F, WT-295 WT-185F, TR-5000
TY-P23M	Penton	Self-Locking	1/16" to 5/8"	15 lbs.	.091"	3.62"	WT-195F, WT-199
TY-P25M	Penton	Self-Locking	1/16" to 1-3/4"	25 lbs.	.184"	7.31"	WT-195F, WT-199
TY-P27M	Penton	Self-Locking	3/16" to 3-1/2"	60 lbs.	.301"	13.38"	WT-196F
TY-P28M	Penton	Self-Locking	1/16" to 4"	25 lbs.	.184"	14.19"	WT-195F, WT-199
TY-3X	Zytel 37	Twist	1/16" to 5/8"	18 lbs.	.091"	3.62"	WT-185F, WT-293 TR-3000
TY-5X	Zytel 37	Twist	1/16" to 1-3/4"	50 lbs.	.184"	7.31"	WT-183F, WT-295 WT-185F, TR-5000
TY-7X	Zytel 37	Twist	3/16" to 3-1/2"	120 lbs.	.301"	13.30"	WT-186F
TY-8X	Zytel 37	Twist	1/16" to 4"	50 lbs.	.184"	14.19"	WT-183F, WT-295 WT-185F, TR-5000
TY-23MX	Zytel 37	Self-Locking	1/16" to 5/8"	18 lbs.	.091"	3.62"	WT-195F, WT-199
TY-25MX	Zytel 37	Self-Locking	1/16" to 1-3/4"	50 lbs.	.184"	7.31"	WT-195F, WT-199
TY-27MX	Zytel 37	Self-Locking	3/16" to 3-1/2"	120 lbs.	.301"	13.38"	WT-196F
TY-28MX	Zytel 37	Self-Locking	1/16" to 1-3/4"	50 lbs.	.184"	14.19"	WT-195F, WT-199
TY-S5	Stainless Steel	Roll Up	1-3/4"	— lbs.	.187"	7.0"	Needle-Nose Pliers

## A TY-RAP™ TIE COST REDUCTION EVALUATION

Because the *TY-RAP* Method is a complete system, it becomes important, when evaluating the economies of the system, to take many points into consideration. So that you can evaluate the *TY-RAP* System as it applies to your particular case, we have prepared a cost evaluation which you can complete with your own figures.

You will find in your cost study that not only do *TY-RAP* ties tie many times faster than string, but one-third to one-half less ties need to be made because of uniformity of tightness, wide gripping surface, and convex rib design of the *TY-RAP* tie.

### COST OF NYLON TWINE TYPE P CLASS 2 MIL-T-713A

\_\_\_\_\_ YARDS IN 1 POUND SPOOL MULTIPLIED BY

\_\_\_\_\_ X 36 GIVES YOU

\_\_\_\_\_ NUMBER OF INCHES IN A 1 POUND SPOOL. DIVIDE THIS BY

\_\_\_\_\_ NUMBER OF INCHES USED TO MAKE 1 AVERAGE  
HARNESS TIE TO GET

\_\_\_\_\_ NUMBER OF TIES IN A 1 POUND SPOOL (DETERMINED)  
ABOVE) EQUALS

\_\_\_\_\_ NUMBER OF POUNDS OF STRING USED PER FINISHED ASSEMBLY.  
THIS MULTIPLIED BY

\$ \_\_\_\_\_ PRICE OF 1 POUND OF STRING EQUALS

\$ \_\_\_\_\_ COST OF STRING TIES FOR 1 FINISHED ASSEMBLY  
MULTIPLY THIS BY

\_\_\_\_\_ ASSEMBLIES TO BE PRODUCED TO DETERMINE

\$ \_\_\_\_\_ COST OF NYLON STRING FOR TOTAL NUMBER OF ASSEMBLIES



### COST OF TY-RAP TIES

\_\_\_\_\_ NUMBER OF *TY-RAP* TIES USED PER FINISHED ASSEMBLY  
MULTIPLIED BY

\$\_\_\_\_\_ COST OF 1 *TY-RAP* TIE GIVES YOU

\$\_\_\_\_\_ COST *TY-RAP* TIES FOR 1 FINISHED ASSEMBLY.

\$\_\_\_\_\_ COST OF CHANGEOVER — I.E., TOOLS, ENG., LEARNING TIME  
COMPUTED PER ASSEMBLY.

\$\_\_\_\_\_ TOTAL COST — MATERIALS AND CHANGEOVER.

### COMPARISON OF TY-RAP TIES VERSUS NYLON STRING

NYLON  
STRING

TY-RAP  
TIES

\_\_\_\_\_ TOTAL TIES PER ASSEMBLY ( $\frac{1}{3}$  TO  $\frac{1}{2}$  LESS *TY-RAP* TIES NEEDED)

\_\_\_\_\_ NUMBER OF SECONDS PER TIE OPERATION. (*TY-RAP* average time 5 sec.)  
DIVIDE BY

\_\_\_  $\div$  3600    \_\_\_  $\div$  3600 TO OBTAIN

\_\_\_\_\_ NUMBER OF HOURS PER FINISHED ASSEMBLY  
MULTIPLIED BY

\$\_\_\_\_\_ \$\_\_\_\_\_ COST PLUS OVER-HEAD PER ACTUAL HOUR GIVES YOU

\$\_\_\_\_\_ \$\_\_\_\_\_ INSTALLATION COSTS. ADD TO THIS

\$\_\_\_\_\_ \$\_\_\_\_\_ MATERIAL AND CHANGEOVER COSTS TO OBTAIN

\$\_\_\_\_\_ \$\_\_\_\_\_ TOTAL COST PER FINISHED ASSEMBLY

\$\_\_\_\_\_ *Net Savings Using TY-RAP Ties — Subtract Total  
TY-RAP Ties Cost From Total String Tie Costs.*

# CLAMPING, MOUNTING AND HANGING BY THE *TY-RAP*<sup>TM</sup> METHOD

When fastening or hanging harnesses and bundles, you can cut costs considerably by using *TY-RAP* Cable Straps and Mounts. With the *TY-RAP* clamping method, you can eliminate a large inventory of various sized plastic and metal clamps because *TY-RAP* Cable Straps and *TY-RAP* ties with Mounts are infinitely adjustable within their range. You need to stock only two or three sizes of *TY-RAP* Cable Straps, or *TY-RAP* ties and Mounts in order to satisfy all of your fastening and clamping requirements. These accessories can be used in all environmental applications involving clamping of cable, tubing, pipes, and bundles. Electronic companies find them ideal for mounting components securely onto chassis. You will find that these Cable Straps and Mounts provide the most attractive method of mounting you've ever seen!

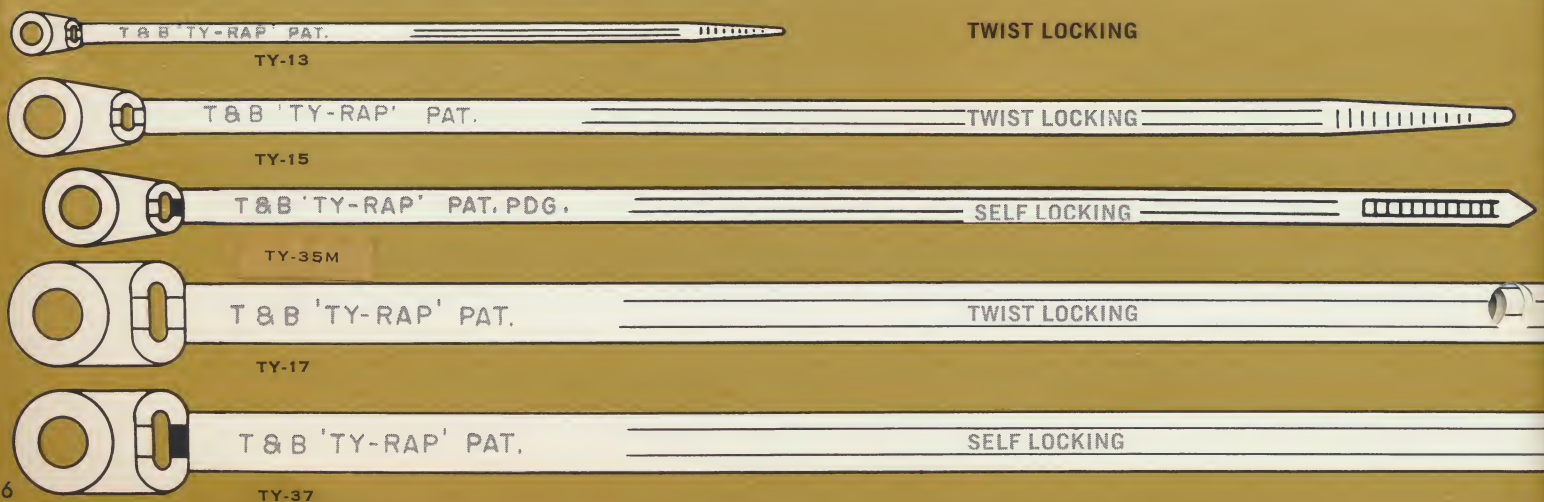


IN-LINE HOLE TYPE

**TY-RAP CABLE STRAPS** By the simple addition of a mounting hole, the *TY-RAP* tie has been transformed into a *TY-RAP* Cable Strap. Just fasten the Cable Strap to the cable, then fasten the Strap to the chassis or cabinet.

They are available in both Twist-Locking and Self-Locking types. In addition to the popular In-Line Hole Type, *TY-RAP* Cable Straps also may be obtained in these variations:

- **Key Slot Type**
- **Offset Hole Type**
- **Threaded Insert Type**
- **Push-In Mounting Type**
- **Solid Head (No Hole) Type**





**TWIST-LOCKING TY-RAP CABLE STRAPS**

CAT. NO.	BUNDLE RANGE	MIN. TENSILE HOLDING STRENGTH	MOUNTING HOLE SIZE	WIDTH	LENGTH	MATERIAL	INSTALLING TOOLS
TY-13	1/16" to 5/8"	18 lbs.	#4 Screw	.091"	4.00"	Nylon*	WT-185F, TR-3000, WT-293
TY-15	1/16" to 1-3/4"	50 lbs.	#10 Screw	.184"	7.81"	Nylon*	WT-183F, WT-185F, TR-5000, WT-295
TY-T415	1/16" to 1-3/4"	50 lbs.	#4 - 40	.184"	7.81"	Nylon*	WT-183F, WT-185F, TR-5000, WT-295
TY-T615	1/16" to 1-3/4"	50 lbs.	#6 - 32	.184"	7.81"	Nylon*	WT-183F, WT-185F, TR-5000, WT-295
TY-K15	1/16" to 1-3/4"	50 lbs.	#10 Screw	.184"	8.31"	Nylon*	WT-183F, WT-185F, TR-5000, WT-295
TY-F15	1/8" to 3/8"	50 lbs.	#6 Screw	.184"	7.25"	Nylon*	WT-183F, WT-185F, TR-5000, WT-295
TY-D15	1/16" to 1-3/4"	50 lbs.	—	.184"	7.81"	Nylon*	WT-183F, WT-185F, TR-5000, WT-295
TY-17	3/16" to 3-1/2"	120 lbs.	1/4" Screw	.301"	13.93"	Nylon*	WT-186F
TY-T817	3/16" to 3-1/2"	120 lbs.	#8 - 32	.301"	13.93"	Nylon*	WT-186F
TY-T1017	3/16" to 3-1/2"	120 lbs.	#10 - 32	.301"	13.93"	Nylon*	WT-186F
TY-38	1/16" to 1-3/4"	50 lbs.	1/4"	.184"		Nylon*	WT-183F, WT-185F, TR-5000, WT-295

**SELF-LOCKING TY-RAP CABLE STRAPS**

TY-35M	1/16" to 1-3/4"	50 lbs.	#10 Screw	.184"	7.81"	Nylon*	WT-195F, WT-199
TY-T435M	1/16" to 1-3/4"	50 lbs.	#4 - 40	.184"	7.81"	Nylon*	WT-195F, WT-199
TY-T635M	1/16" to 1-3/4"	50 lbs.	#6 - 32	.184"	7.81"	Nylon*	WT-195F, WT-199
TY-K35M	1/16" to 1-3/4"	50 lbs.	#10 Screw	.184"	8.31"	Nylon*	WT-195F, WT-199
TY-D35M	1/16" to 1-3/4"	50 lbs.	—	.184"	7.81"	Nylon*	WT-195F, WT-199
TY-F35M	1/8" to 3/8"	50 lbs.	#6 Screw	.184"	7.25"	Nylon*	WT-195F, WT-199
TY-37	3/16" to 3-1/2"	120 lbs.	1/4" Screw	.301"	13.93"	Nylon*	WT-100M, WT-111M
TY-T837M	3/16" to 3-1/2"	120 lbs.	#8 - 32	.301"	13.93"	Nylon*	WT-100M, WT-111M
TY-T1037M	3/16" to 3-1/2"	120 lbs.	#10 - 32	.301"	13.93"	Nylon*	WT-100M, WT-111M
TY-38M	3/16" to 1-3/4"	50 lbs.	1/4"	.184"		Nylon*	WT-195F, WT-199

\*These cable straps also may be obtained composed of black Zytel 37 (outdoor material) and green Penton. To order these materials, just add the letters X (for Zytel 37 Nylon) or P (for Penton) after the catalog numbers. For example: TY-13X is a Zytel 37 TY-13 tie — TY-P13 is a Penton TY-13 tie

**SPECIAL MATERIALS  
AND CONFIGURATIONS  
AVAILABLE THROUGH  
YOUR T&B SALESMAN**

**HOW TO ORDER  
COLOR CODED  
TY-RAP CLAMPS**

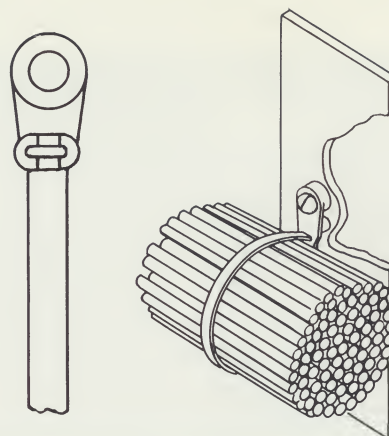
Natural Nylon (white) is standard and will be shipped if no other color is specified. Should you need colored Clamps, add the following dash numbers to *TY-RAP* Catalog numbers.

COLOR	DASH NO.	COLOR	DASH NO.
Black	— 0	Green	— 5
Brown	— 1	Blue	— 6
Red	— 2	Purple	— 7
Orange	— 3	Gray	— 8
Yellow	— 4		

Example: TY-13-3 would be an orange TY-13.

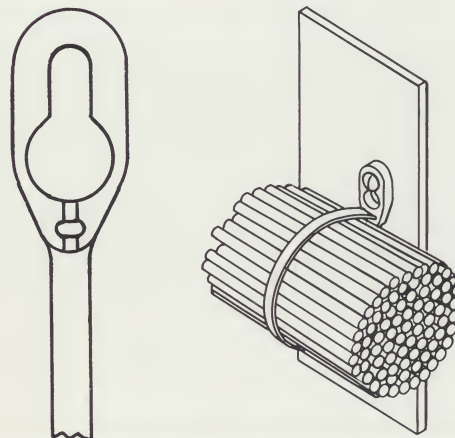
Cable Straps — see dimensional information above.

**IN-LINE HOLE TYPES TY-13, TY-15, TY-17 TY-35M, TY-37** This Strap is simply a *TY-RAP* tie with an additional length of head in which is molded a hole of suitable size. In use, the Strap is fastened to the cable or bundle in the usual manner. Then, the Strap (and the cable) are fastened to the mounting surface by means of a screw placed in the mounting hole. It can be seen how much simpler and easier this method of clamping is than any other method you have ever used!

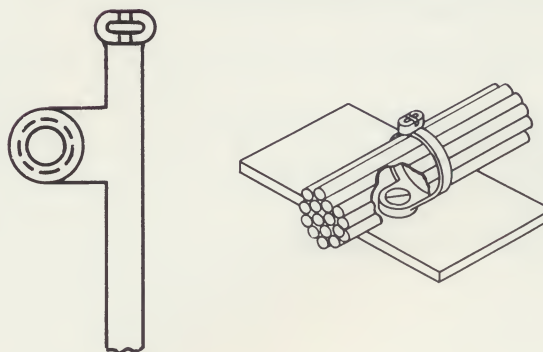


**KEY SLOT TYPES TY-K15, TY-K35M**

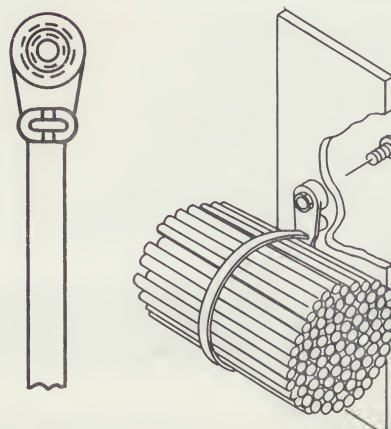
Attach the Key Slot Clamp to the harness or cable in the usual manner. The wide portion of the slot is placed over the head of a pre-mounted screw, and the narrow portion is slid under the screw.



**OFFSET HOLE TYPE TY-F15** Fasten Cable Strap to mounting surface with screw. Then tie cable with Cable Strap in usual manner. With this Cable Strap, the tie remains visible at all times, permitting inspection even after cable or harness is mounted.

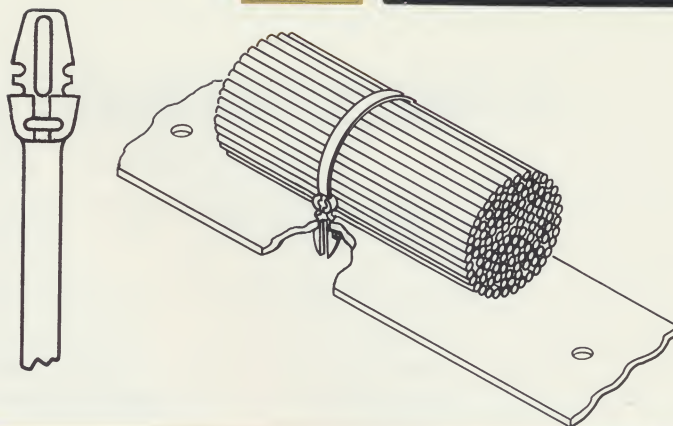


**THREADED INSERT TYPES TY-T415, TY-T615, TY-T435M, TY-T635M, TY-T817, TY-T1017, TY-T837M, TY-T1037M** A threaded insert is mounted snugly in the head of this clamp so that clamping is accomplished with a screw that is brought in from the back side of the chassis. That is practical because the screwdriver can be used on outside of chassis, rather than on inside where wiring and components make installation difficult.

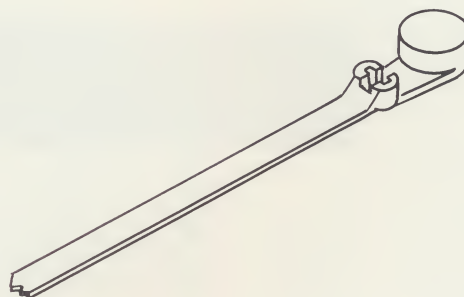




**PUSH-IN MOUNTING TYPES TY-38, TY-38M** After the *TY-RAP* Cable Strap is fastened around the cable, it is installed by placing the projecting prongs in a hole drilled at the position where the cable is to be mounted. A push sets the prongs in the hole.



**SOLID HEAD TYPE TY-D15, TY-D35M** This *TY-RAP* Cable Strap provides for several methods of mounting. It can be drilled for any size screw necessary, or it can be drilled to accept inserts and bushings.

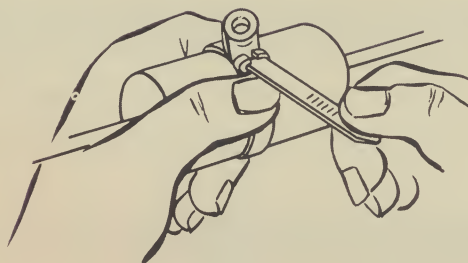


**TYING WITH TY-RAP CABLE STRAPS** In order to suit your individual requirements, *TY-RAP* Clamps are offered in both Twist-Locking and Self-Locking styles. Either variety is easy to tie — and a number of dependable manual or pneumatic tools are available to aid you in performing the fastest, neatest ties possible.

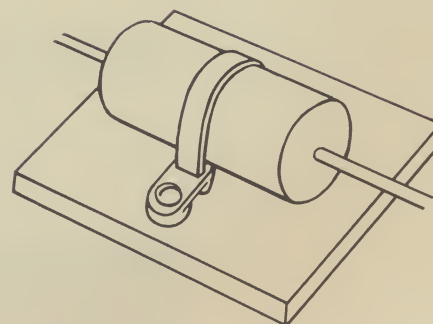
The *TY-RAP* Cable Strap Chart lists all the Straps and their applicable tools. For a complete description of tying, and the tools used, refer to the first section in this catalog.

#### MOUNTING COMPONENTS WITH THE TY-RAP CABLE STRAP

TY-RAP CLAMPS CAN BE USED TO MOUNT COMPONENTS TIGHTLY IN PLACE WITH A SINGLE SCREW OR FASTENER. SIMPLY TIE THE COMPONENT WITH A TY-RAP (FIGURE 1). THEN PUT A SCREW THROUGH THE HOLE IN THE CLAMP, AND FASTEN THE ASSEMBLY TO THE CHASSIS (FIGURE 2).



(FIGURE 1)



(FIGURE 2)

## CLAMPING ECONOMIES

*TY-RAP* Clamps offer you both time savings and weight savings. In many aerospace applications, even several ounces saved per assembly or vehicle can be important. While providing considerable weight savings, *TY-RAP* Clamps offer holding strengths comparable to the bulkier clamps they replace.

Listed here is a typical study of weight savings realized by using *TY-RAP* clamps. You can determine weight savings for your particular case by inserting your own figures.

### WEIGHT SAVINGS TY-RAP CABLE STRAPS VS. PLASTIC CLAMPS

3.0293	GRAMS — WEIGHT OF MS21919 WDG-4 PLASTIC CLAMP
X300	QUANTITY OF WDG-4 PLASTIC CLAMPS USED PER FINISHED ASSEMBLY
908.79	GRAMS — TOTAL WEIGHT OF WDG-4 PLASTIC CLAMPS
3.1845	GRAMS — WEIGHT OF MS21919 WDG-5 PLASTIC CLAMP
X400	QUANTITY OF WDG-5 PLASTIC CLAMPS USED PER FINISHED ASSEMBLY
1,273.80	GRAMS — TOTAL WEIGHT OF WDG-5 PLASTIC CLAMPS
3.7767	GRAMS — WEIGHT OF MS21919 WDG-6 PLASTIC CLAMP
X500	QUANTITY OF WDG-6 PLASTIC CLAMPS USED PER FINISHED ASSEMBLY
1,888.35	GRAMS — TOTAL WEIGHT OF WDG-6 PLASTIC CLAMPS
4,070.94	GRAMS — TOTAL WEIGHT 1200 PLASTIC CLAMPS (WDG-4, -5, -6)
—847.44	GRAMS — TOTAL WEIGHT 1200 TY-15 <i>TY-RAP</i> CABLE STRAPS
3223.50	GRAMS — TOTAL WEIGHT SAVING USING TY-15 <i>TY-RAP</i> CABLE STRAPS
÷453.59	GRAMS — CONVERTING GRAMS TO POUNDS
7.10	<i>Pounds Saved Using TY-15 TY-RAP Cable Straps</i>
79%	<i>Weight Reduction Achieved With TY-RAP Cable Straps</i>



# TYPICAL RESULTS OBTAINED DURING TESTING OF TY-RAP™ CABLE STRAPS

The following charts should acquaint you with the performance of *TY-RAP* Clamps. These results were obtained during a testing project conducted in accordance with Military Specification MIL-S-23190A (WEP) for qualification as Class I Straps. It can be seen from the results that, in every case, the TY-35M *TY-RAP* Clamps tested exceeded the necessary minimum tensile strength requirements called out in the specification.

Sample Tested: TY-35M Self-Locking *TY-RAP* Tie

TENSILE STRENGTH TEST			
SAMPLE NUMBER	FLUID	ACTUAL TENSILE STRENGTH VALUES (LBS.)	TENSILE STRENGTH REQUIRED (LBS.)
1		67	50
2		65	50
3		64	50
4		72	50
5		67	50
6		68	50
7		63	50
8		64	50
9		68	50
10		67	50
11		70	50
12		66	50
13		67	50
14		69	50
15		66	50
16		67	50
17		67	50
18		59	50
19		64	50
20		66	50
LIFE TEST *			
1		91	50
2		101	50
3		90	50
4		95	50
5		85	50
6		84	50
7		83	50
8		107	50
9		81	50
10		93	50
IMMERSION TEST †			
1	Jet Fuel	89	50
2	MIL-J-5624	79	50
3	Anti-icing	78	50
4	MIL-F-5566	78	50
5	Lub. Oil	78	50
6	MIL-L-7808	82	50
7	Hydr. Fluid	79	50
8	MIL-H-5606	76	50

\*Life Test — Conducted in accordance with MIL-S-23190A (WEP). Ties are subjected to extremes of heat and cold and then tested for tensile strength.

†Immersion Test — Conducted in accordance with MIL-S-23190A (WEP). Cable straps are immersed in various fluids for four hours at temperatures of 48 to 50°C (118 to 122°F), and then tested for tensile strength.

## PRE-MOUNTABLE BASES AND CLAMPS

High density electronic packaging has created a need for bases and clamps that can be installed when equipment is most accessible. Increased demand has led to the development of a new line of premountable bases and clamps, all of which feature high strength, miniaturization, lightweight, versatility, and ease of installation. Further, some of these bases can be obtained with a solvent activated adhesive backing which bonds the base tightly to the mounting surface. Ten styles of Pre-Mountable Bases and Clamps are available.

- **Single Bolt Hole Mounting Type**
- **Double Bolt Hole Mounting Type**
- **Multiple Mounting Type**
- **Right Angle Mounting Type**
- **Tap-In Mounting Type**
- **Threaded Insert Type**
- **Bolt Type**
- **Aluminum Single Bolt Hole Mounting Type**
- **"C" Loop Cable Retaining Clamp**
- **Adjustable Flat Cable Clamp**



**TEST RESULTS OBTAINED  
USING ADHESIVE-BACKED MOUNTS**

CAT. NO.	STATIC LOAD, LBS.				PULL OFF FORCE, LBS.			
	15 MIN.	1 HR.	24 HR.	48 HR.	15 MIN.	1 HR.	24 HR.	48 HR.
TC-103A	3	6	20	30	25	40	50	60
TC-105A	2	4	5	20	15	20	29	42
TC-106A	2	4	7	10	5	23	30	45
TC-111A	2	4	15	25	16.5	23	35	56

### HOW TO MOUNT ADHESIVE-BACKED BASES

In order to mount the adhesive-backed bases, it is first necessary to apply an activator solution (Cat. No. TC-110) to surface of the base. Immediately, the adhesive is activated. Next, press the base in position . . . within 15 minutes, it withstands moderate strain. After several hours, the base will adhere tightly to the surface.



## HOW TO ORDER COLOR CODED MOUNTS AND CLAMPS

White is standard and will be shipped if no other color is specified. Should you need colored mounts and clamps, add the following dash numbers to the Catalog numbers.

COLOR	DASH NO.	COLOR	DASH NO.
Black	— 0	Green	— 5
Brown	— 1	Blue	— 6
Red	— 2	Purple	— 7
Orange	— 3	Gray	— 8
Yellow	— 4		

Example: TC-116-4 would be a yellow knock-in mounting base.

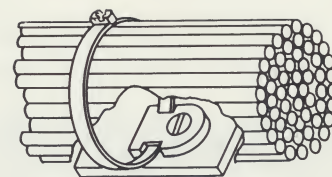
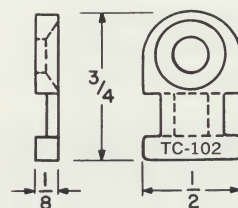
## MOUNTING BASES AND CLAMPS

CAT. NO.	STRAP WIDTH ACCOMMODATED	MINIMUM TENSILE HOLDING STRENGTH	MOUNTING HOLE SIZE	WIDTH	LENGTH	MATERIAL	USED WITH	REMARKS
TC-101	.184"	50 lbs.	#10 Screw	1/2"	1-31/32"	Nylon	TY-3, 5, 8, 23M, 25M, 28M, 42, 46M	
TC-102	.184"	50 lbs.	#8 Screw	1/2"	3/4"	Nylon		
TC-103	.301"	120 lbs.	#10 Screw	5/8"	3-5/64"	Nylon	TY-7, 27M	
TC-103A	.301"	*	#10 Screw	5/8"	3-5/64"	Nylon		Adhesive Backed
TC-104	.091"	18 lbs.	#5 Screw	5/16"	13/32"	Nylon	TY-3, 23M	
TC-105A	.184"	*	#10 Screw	1/2"	1"	Alum.	TY-3, 5, 8, 23M, 25M, 28M, 42, 46M	Adhesive Backed
TC-106	.301"	120 lbs.	2 #4 Screws	1"	1"	Nylon		
TC-106A	.301"	*	2 #4 Screws	1"	1"	Nylon		Adhesive Backed
TC-107	.184"	50 lbs.	#10 Screw	7/16" square	1/2"	Nylon		10-32 TH'D, Self locking
TC-108	.184"	—	—	5/8"	2-3/4"	Nylon	TY-5	
TC-109	.200"	18 lbs.	2 #2 Screws	9/16"	Max. 7/16"	Nylon	TY-3, 23M	
TC-110	—	—	—	—	—	—	—	Activator for Adhesive
TC-111A	.184"	*	—	1/2"	1-31/32"	Nylon	Same as TC-101	Adhesive Backed
TC-70	—	—	#10 Screw	.400"	—	Rigid PVC	—	1/4" Cable Diameter
TC-71	—	—	#10 Screw	.400"	—	Rigid PVC	—	1/2" Cable Diameter
TC-72	—	—	#10 Screw	.500"	—	Rigid PVC	—	3/4" Cable Diameter
TC-73	—	—	#10 Screw	.500"	—	Rigid PVC	—	1" Cable Diameter
TC-74	—	—	#10 Screw	.500"	—	Rigid PVC	—	1-1/2" Cable Diameter
TC-116	.184"	See Chart Page 26	#6 Screw	1/2"	3/4"	Nylon	TY-3, 5, 8, 23M, 25M, 28M, 42, 46M	Color Coded Red
TC-118	.184"	See Chart Page 26	#8 Screw	1/2"	3/4"	Nylon		Color Coded Blue
TC-120	.184"	See Chart Page 26	#10 Screw	1/2"	3/4"	Nylon		Color Coded Yellow
TC-1112	.301"	120 lbs.	1/8" rivets	5/8"	9.60"	Nylon	TY-3, 5, 7, 8, 23M, 25M, 27M, 28M, 42, 46M	Holds 6 Bundles
TC-1113	.301"	120 lbs.	1/8" rivets	5/8"	2.10"	Nylon		Holds 1 Bundle
TC-1114	.301"	120 lbs.	1/8" rivets	5/8"	3.60"	Nylon		Holds 2 Bundles
TC-1115	.301"	120 lbs.	1/8" rivets	5/8"	5.10"	Nylon		Holds 3 Bundles
TC-1116	.301"	120 lbs.	1/8" rivets	5/8"	6.60"	Nylon		Holds 4 Bundles
TC-1117	.301"	120 lbs.	1/8" rivets	5/8"	8.10"	Nylon		Holds 5 Bundles
TC-T4104	.091"	18 lbs.	#4-40 insert	5/16"	13/32"	Nylon	TY-3, 23M	
TC-T6102	.184"	50 lbs.	#6-32 insert	1/2"	3/4"	Nylon	TY-3, 5, 8, 23M, 25M, 28M, 42, 46M	
TC-T8102	.184"	50 lbs.	#8-32 insert	1/2"	3/4"	Nylon		

\*See "TEST RESULTS OBTAINED USING ADHESIVE-BACKED MOUNTS" Page 22

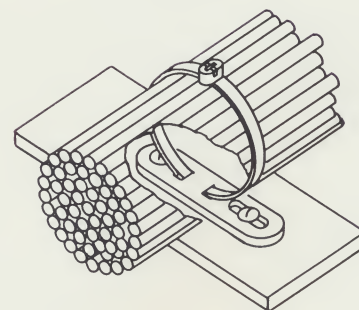
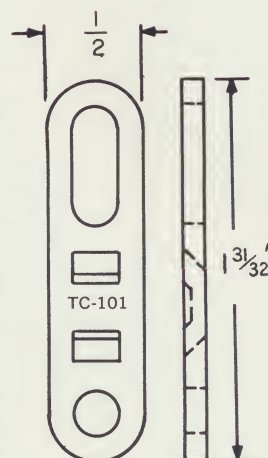
**SINGLE BOLT HOLE MOUNTING TYPES**

**TC-102, TC-104** A single hole in the Mount accepts a screw for fastening to chassis or other surface. When cable or harness is ready for tying, slide a *TY-RAP* tie under slot in Mount, and complete tie in usual manner.

**DOUBLE BOLT HOLE MOUNTING TYPES**

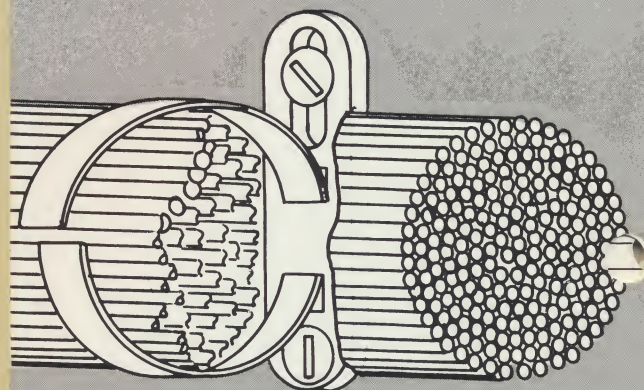
**TC-101, TC-103, TC-103A, TC-111A** With this mount, two holes are provided, one at each end. Secured by two screws, this Mounting Base will hold tight and will not rotate. When the cable is ready to be tied, simply thread the *TY-RAP* tie through the threading holes (the tail comes up out of the base and is easy to grasp), bring it around the cable, and complete the tie.

The Double Bolt Mounting Bases also may be obtained with the solvent activated adhesive backing, thereby eliminating any need for screw mounting.



SINGLE HOLE BASE IS PRACTICALLY HIDDEN FROM VIEW AFTER TIE IS MADE.

DOUBLE HOLE BASE HOLDS HELICAL RING WHICH WILL BE REPLACED WITH A TY-RAP TIE AFTER ALL WIRE IS ROUTED.



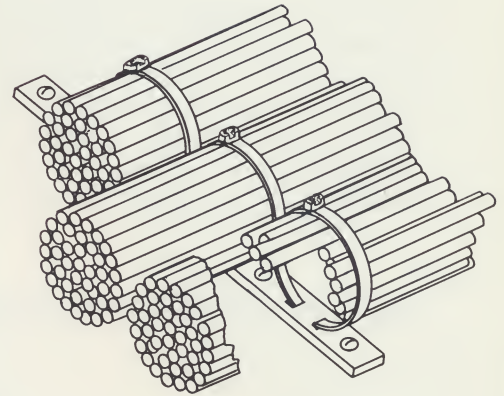
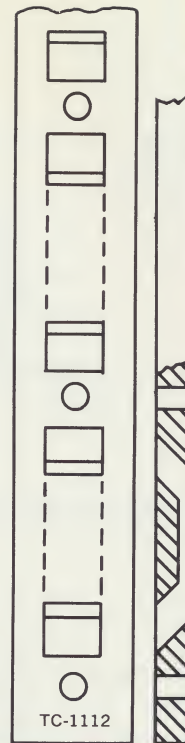


### MULTIPLE MOUNTING STRIPS TC-1112 TO TC-1117

Ideal when two or more parallel, closely spaced bundles must be fastened down. A screw hole in each end, and one between each cable bundle, provides secure mounting of the Base. The Strip can be furnished to accommodate up to six bundles per strip, and any number of strips may be used.

As usual, tying is easy. Just thread the *TY-RAP* tie through the Mounting Base, bring it around the cable, and complete the tie.

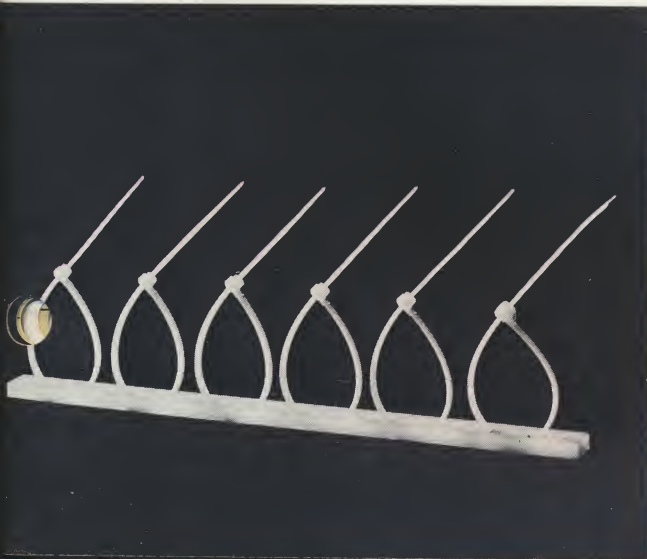
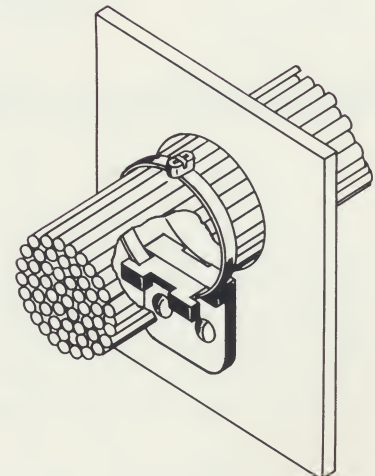
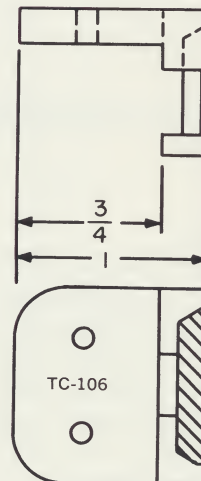
If desired, the Multiple Mounting Strip can be furnished with the solvent activated adhesive back.



### RIGHT ANGLE MOUNTING TYPES TC-106, TC-109

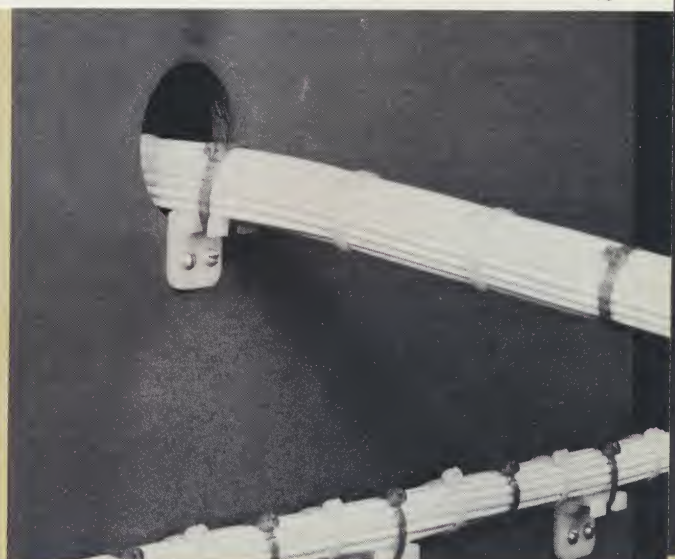
The Corner Mounting Base provides the ideal means of running cable through bulkheads, holes in cabinets, and walls. Positioned properly below the hole and mounted using two screws, it eliminates the need for grommets or other means of cable protection because it holds the cable away from the edges of the opening. It is also available as TC-106A with adhesive backing.

The *TY-RAP* tie, in this case, is placed around both the Mounting Base and the cable; then the tie is completed. The TC-109 made of Zytel 101 Nylon also is available composed of Zytel 37, a carbon-filled Nylon which is resistant to direct sunlight.



UP TO SIX CABLES CAN BE ACCOMMODATED BY MULTIPLE MOUNTING BASES.

RIGHT ANGLE BASE HOLDS CABLE AWAY FROM SHARP EDGES OF HOLE.

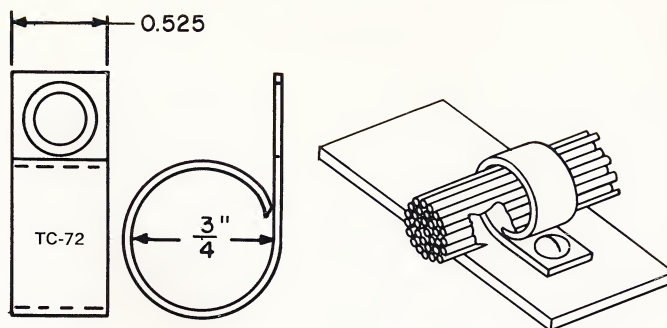




## "C" LOOP CABLE RETAINING CLAMPS

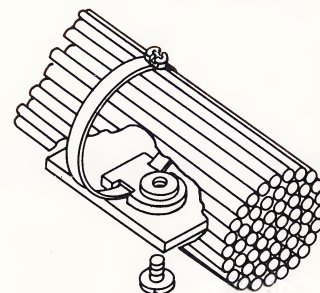
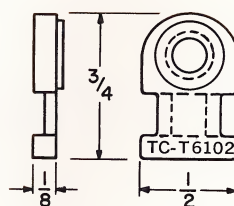
**TC-70, TC-71, TC-72, TC-73, TC-74**

Valuable for supporting long runs of cable in point-to-point wiring, or as a harness making aid, this clamp can be supplied in 5 sizes to accommodate bundles from  $\frac{1}{4}$ " to  $1\frac{1}{2}$ " in diameter. For applications where the loop is expected to receive heavy strain, multiple loop supports are recommended. They can be supplied in N number of sections.



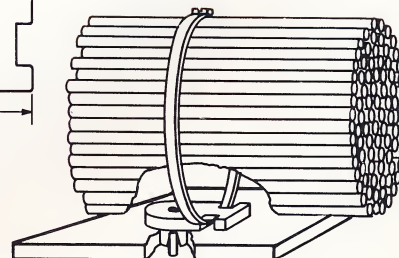
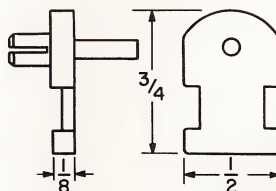
## THREADED INSERT TYPE TC-T6102, TC-T8102, TC-T4104

A threaded insert permits the clamp to be fastened down by a screw brought through from the underside of the mounting surface. A *TY-RAP* tie then is brought under the clamp, around the cable, and tied.



## KNOCK-IN MOUNTING TYPES TC-116, TC-118, TC-120

Place the projecting hollow peg in a hole drilled at the mounting position. Next, a tap of a hammer drives the projecting pin down into the hollow peg — firmly locking the Base in position. Then, slip tie under Base, around cable, and complete tying as usual. The use of the WT-194 seating and pin setting tool is recommended.



26



KNOCK IN BASE MOUNTS  
SECURELY IN DRILLED  
HOLE.

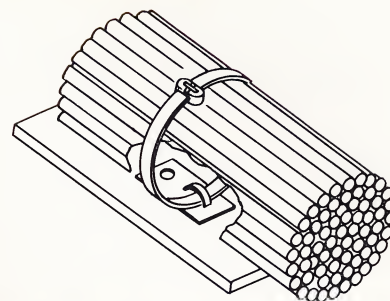
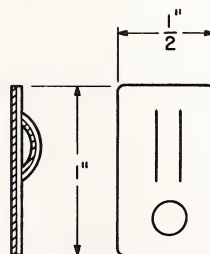
## AVERAGE PULLOUT VALUES EXPECTED WHEN USING CAT. NOS. TC-116, 118, 120 BASES

CAT. NO.	HOLE SIZE	AVERAGE PULLOUT VALUE	REMARKS
TC-116	.143"	25.5 lbs.	It can be seen that drilling the proper size holes is most important to obtain maximum pullout values.
TC-116	.151"	10.1 lbs.	
TC-118	.169"	34.9 lbs.	
TC-118	.178"	19.2 lbs.	
TC-120	.196"	34.8 lbs.	
TC-120	.202"	18.5 lbs.	

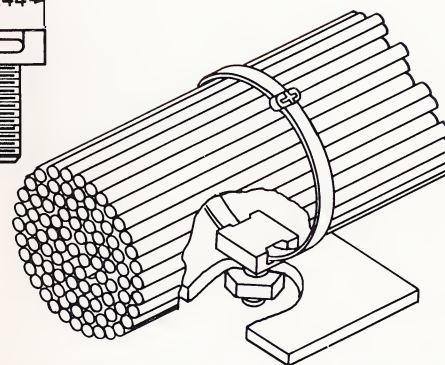
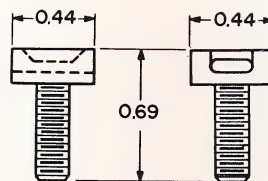


**METAL SINGLE BOLT TYPE TC-105A**

An inexpensive durable mount that can be fastened down with a screw or with adhesive. After tying is completed, the TC-105A is practically hidden from view.

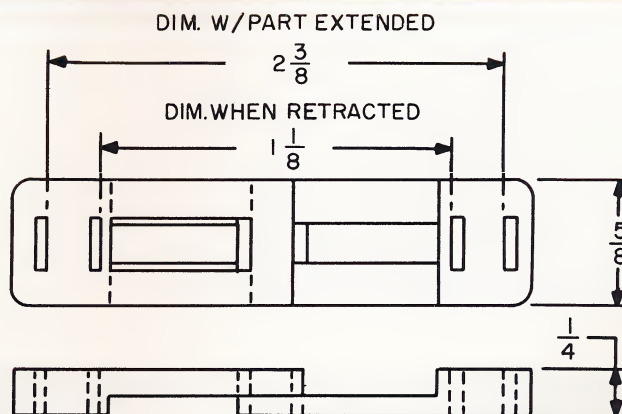
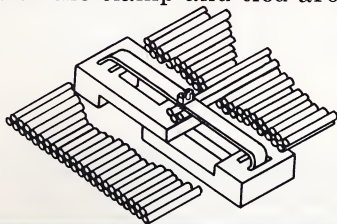


**BOLT TYPE TC-107** Composed of Zytel, the bolt has a square head with a slot through it. It is placed in a drilled hole and quickly locked from beneath with a nut. Tying is accomplished by sliding a *TY-RAP* tie through the slot in the head and bringing it around the cable.



**ADJUSTABLE FLAT CABLE CLAMP TC-108**

The clamp is adjustable so that it can handle widths from  $1\frac{1}{8}$ " to  $2\frac{3}{8}$ ". In operation, one or more flat cables are placed against the clamp and the clamp is adjusted to accommodate the widest cable. Then a TY-5 is threaded through the appropriate slots in the clamp and tied around the cables.



NYLON BOLT BASE IS  
THREADED FOR CON-  
VENIENT MOUNTING.

METAL BASES ARE  
HELD SECURELY BY  
ADHESIVE BACKING.







# IDENTIFICATION THE TY-RAP™ WAY

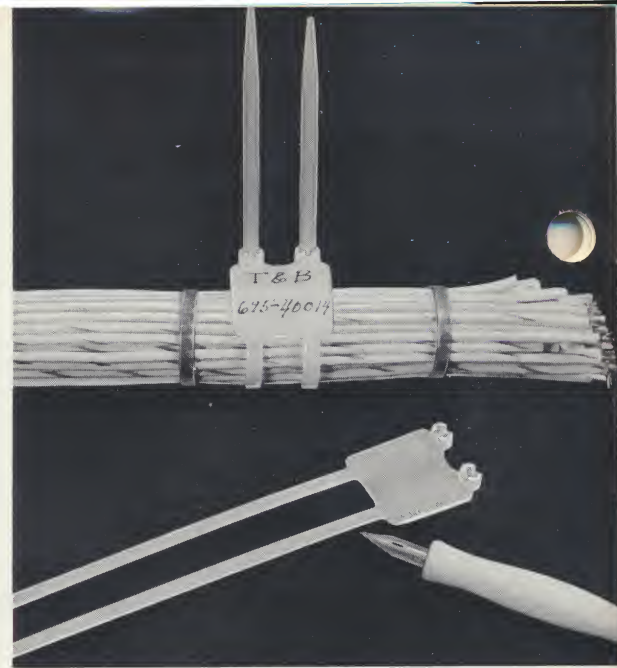
Identification of harnesses, harness breakouts, cabling, tubes, and pipes is important. *TY-RAP* Cable Markers solve this problem, too. Either Identification Ties or Plates, which can be heat-stamped or marked with pencil, ballpoint pen, or other marking instruments, can be used. The Ties and Plates can be ordered heat stamped at the factory, or if desired, dependable heat stamping machines can be purchased (write T&B for recommendations) for on-site marking.

**IDENTIFICATION TIES** Twist-locking and self-locking *TY-RAP* Identification Ties are available in both single and twin configurations. Having a dull, sandblasted surface, they adapt easily to any marking media. Because they serve the dual purpose of tying and identifying, you will achieve the fastest, most economical identification and tying presently possible. As usual, tying is easily accomplished using the manual or pneumatic tools described in the section on Tying.

## HOW TO ORDER COLOR CODED TIES AND PLATES

COLOR	DASH NO.	COLOR	DASH NO.
Black	— 0	Green	— 5
Brown	— 1	Blue	— 6
Red	— 2	Purple	— 7
Orange	— 3	Gray	— 8
Yellow	— 4		

Example: TC-123-5 would be a green TC-123 Identification Plate. For stock thicknesses other than .010" or .015", please contact the T&B representative in your area.



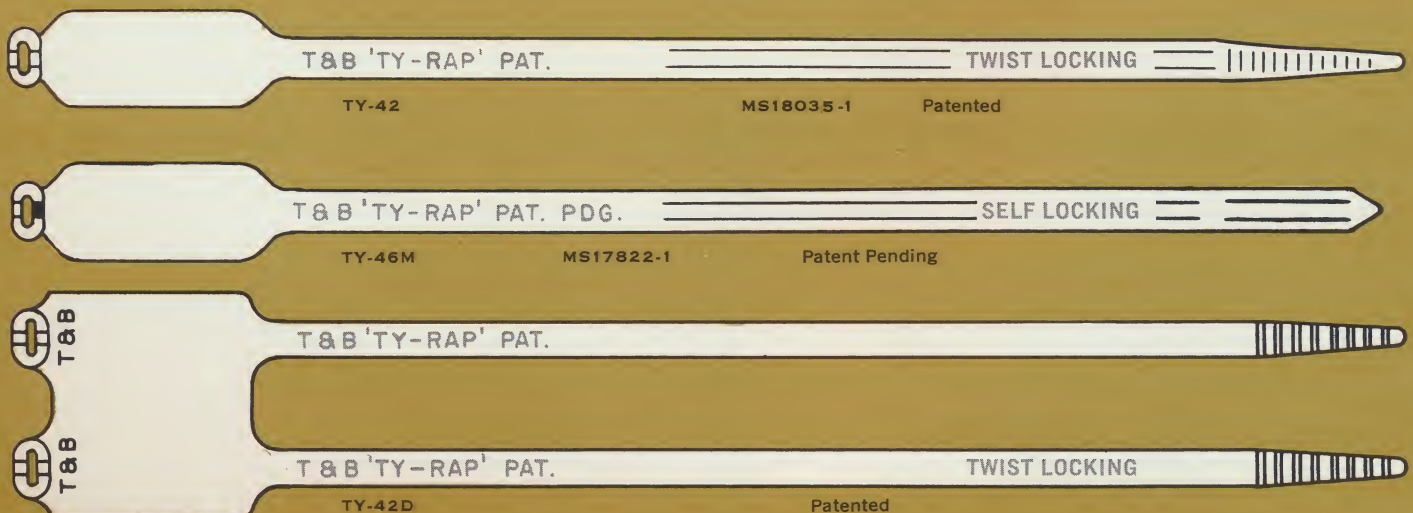
## NASA SPECIFICATIONS

Specification MSFC-STD-110A dated 16 March 1962 for George C. Marshall Space Flight Center, NASA, specifically mentions *TY-RAP* Identification Ties in paragraph 5.4.15.4 titled "Identification."

"5.4.14.4 *Identification* — Cables and harness assemblies shall be identified by a black nylon band conforming to Thomas & Betts Co., part numbers TY-42, or 695-50981-3-0 using TY-8 ties, or approved equals. The applicable reference designation shall be hot stamped in white letters on the black nylon band."

## MILITARY SPECIFICATIONS

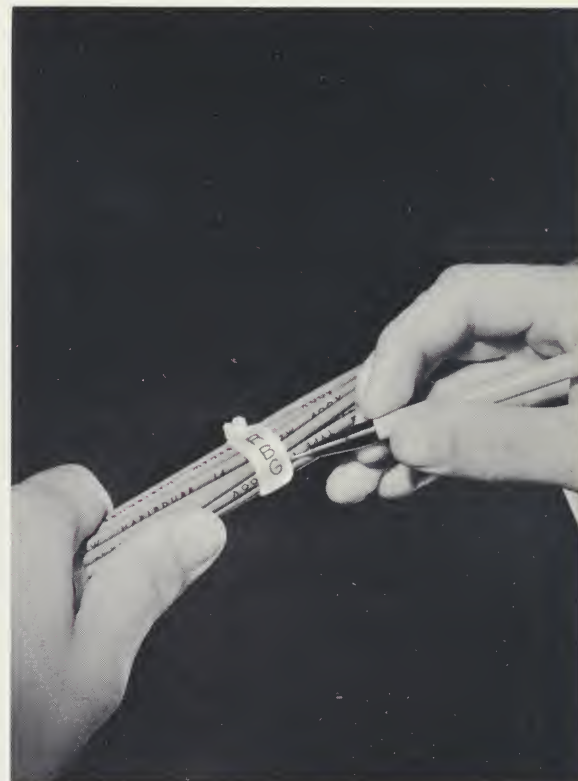
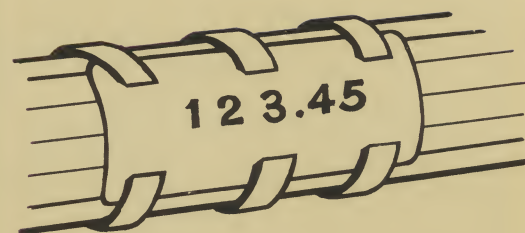
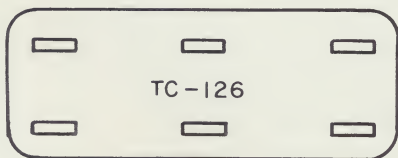
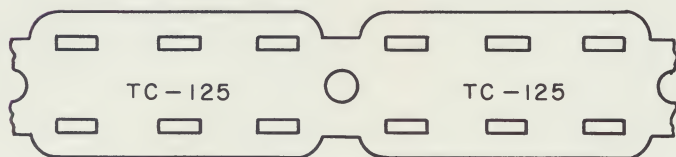
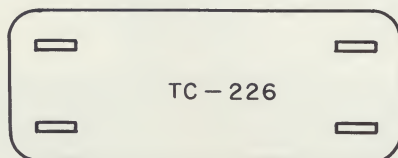
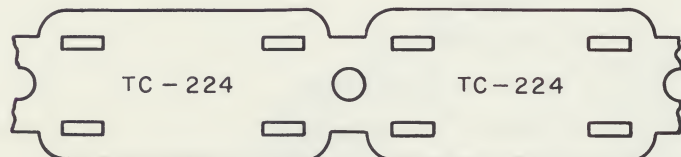
*TY-RAP* meets MIL-S-23190A (WEP) dated 16 March 1964 which specifically covers nylon cable ties. Applicable Military Standards drawing numbers are shown next to dimensional drawings.





**IDENTIFICATION PLATES** Ranging in length from 1¼" to 2½", the Identification Plates are secured to the cable with *TY-RAP* ties or *TY-RAP* straps. They are composed of .010" and .015" thick nylon (other thicknesses can be supplied), and have a surface which adapts to any marking media. If you would like, T&B will heat stamp your plates at the factory.

**CONTINUOUS LENGTHS OF IDENTIFICATION PLATES** Any of the *TY-RAP* Identification Plates can be obtained joined in a continuous length so that you can snip each plate off the continuous strip as needed.



### IDENTIFICATION TIES AND PLATES

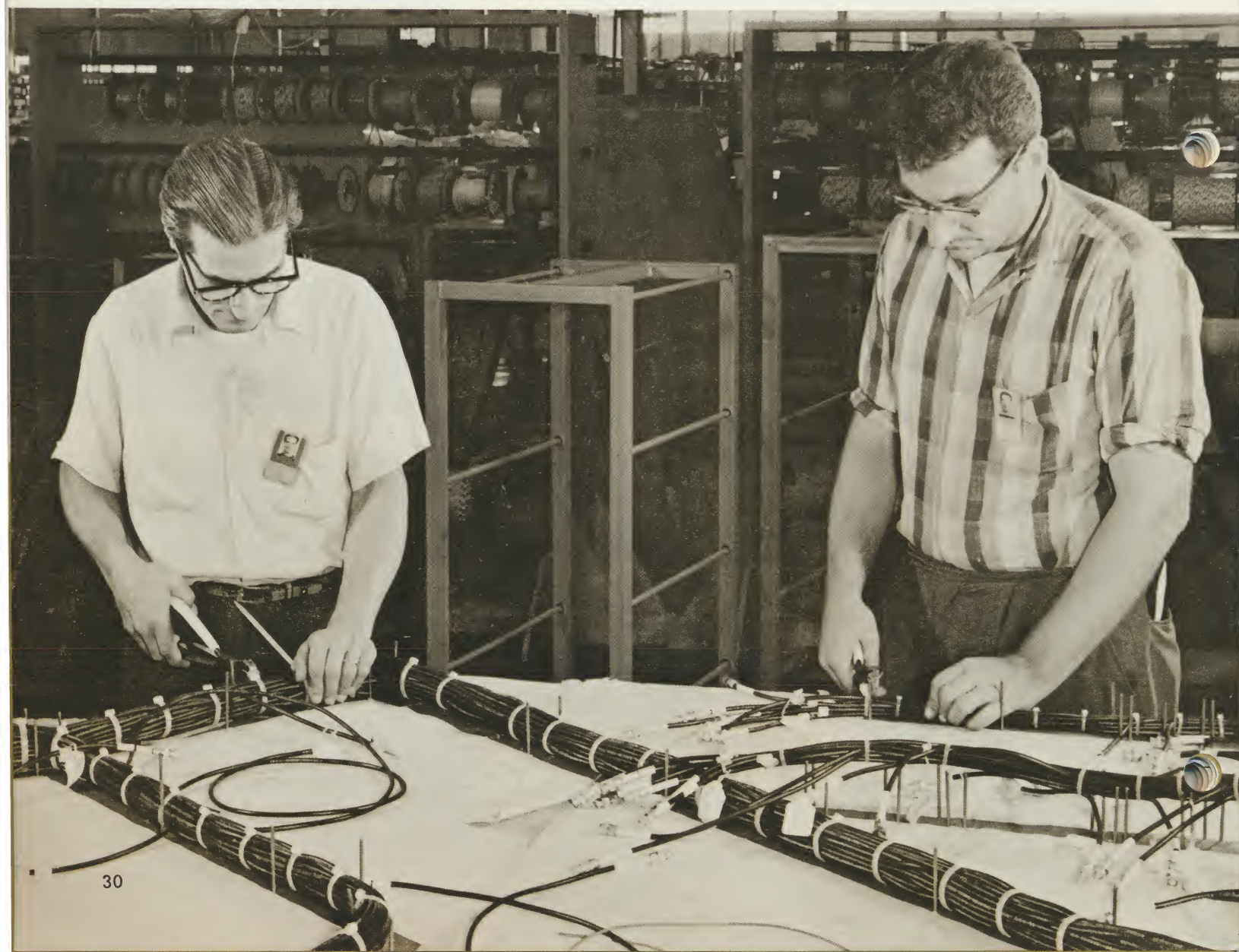
CAT. NO.	BUNDLE RANGE	MINIMUM TENSILE HOLDING STRENGTH	WIDTH	LENGTH	MATERIAL	INSTALLING TOOL	REMARKS
TY-42	3/8" to 1-3/4"	50 lbs.	.184"	7.25"	Nylon	WT-183F, WT-185F, TR-5000	½" x 1" marking pad
TY-42D	3/8" to 1-3/4"	50 lbs.	.184"	7.25"	Nylon	WT-183F, WT-185F, TR-5000	1¼" x 1" marking pad
TY-46M	3/8" to 1-3/4"	50 lbs.	.184"	7.25"	Nylon	WT-195F, WT-199	½" x 7/8" marking pad
TC-123			3/4"	1-1/4"	Nylon		.010" thickness
TC-124			3/4"	1-1/2"	Nylon		.010" thickness
TC-125			3/4"	1-3/4"	Nylon		.010" thickness
TC-126			3/4"	2"	Nylon		.010" thickness
TC-128			3/4"	2-1/2"	Nylon		.010" thickness
TC-224			3/4"	1-1/2"	Nylon		.015" thickness
TC-225			3/4"	1-3/4"	Nylon		.015" thickness
TC-226			3/4"	2"	Nylon		.015" thickness
TC-228			3/4"	2-1/2"	Nylon		.015" thickness



## HARNESS AIDS BY T&B

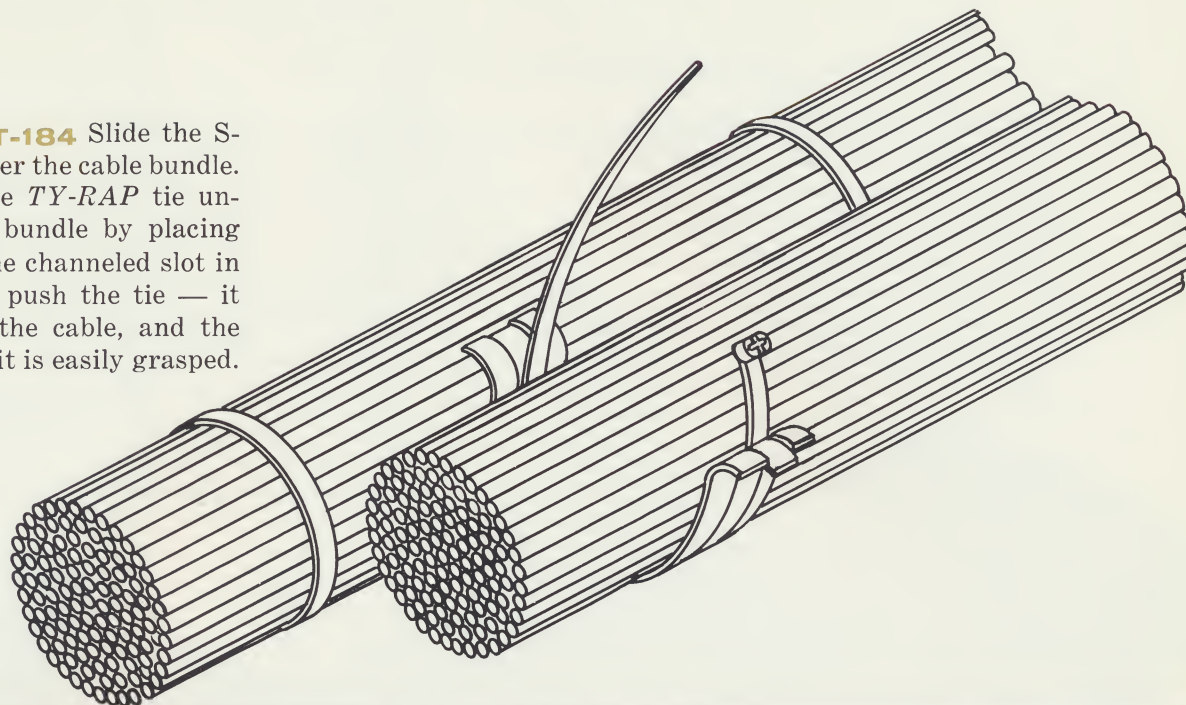
Fast, accurate harnessing and cabling is essential if costs are to be kept to a minimum. Use of *TY-RAP* harnessing aids means that your harnessing jobs will be finished faster, and will be looking better than ever before. All of these aids are customer-engineered to perform specific functions. Encompassing all areas of harnessing, they provide the complete solution to every harnessing requirement. They include:

- **Shoe Horn**
- **Straight Nails**
- **Plastic Chute**
- **Nylon Nails**
- **Ty-Chain**
- **Corner Posts**
- **Bundle Retainers**
- **Helical Rings**
- **Breakout Strips and Holder**

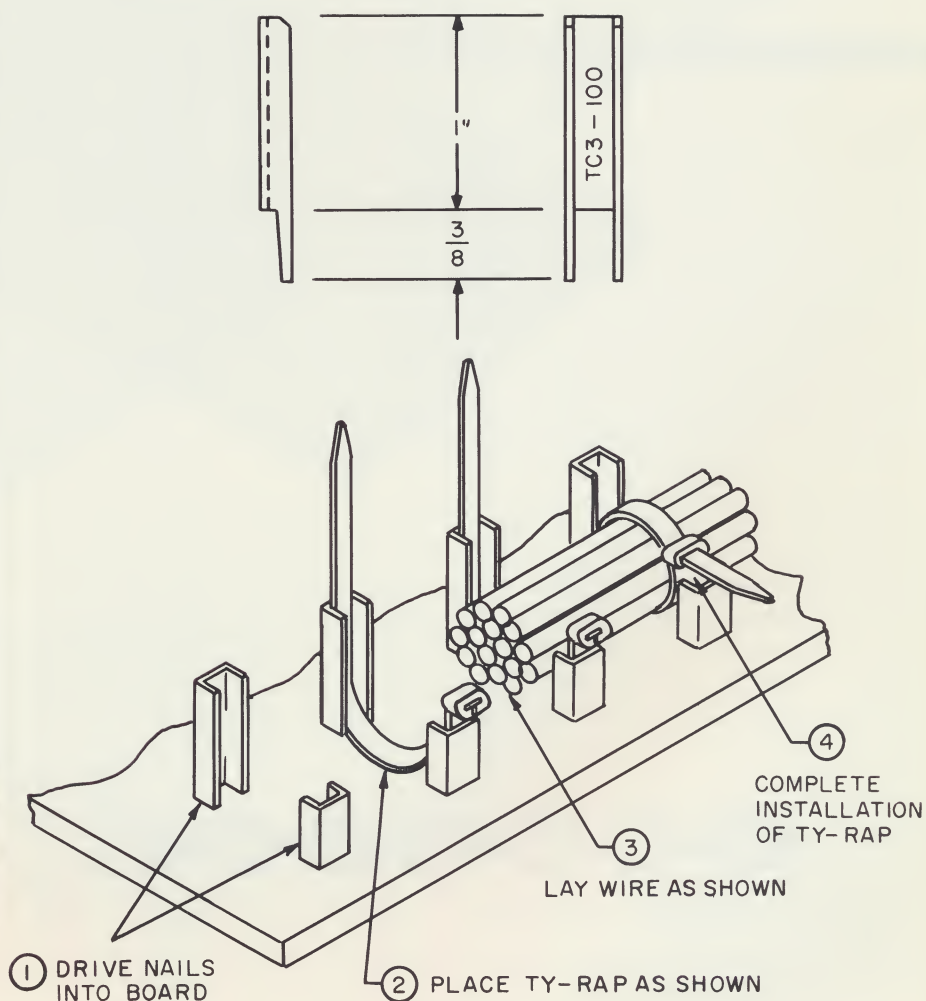




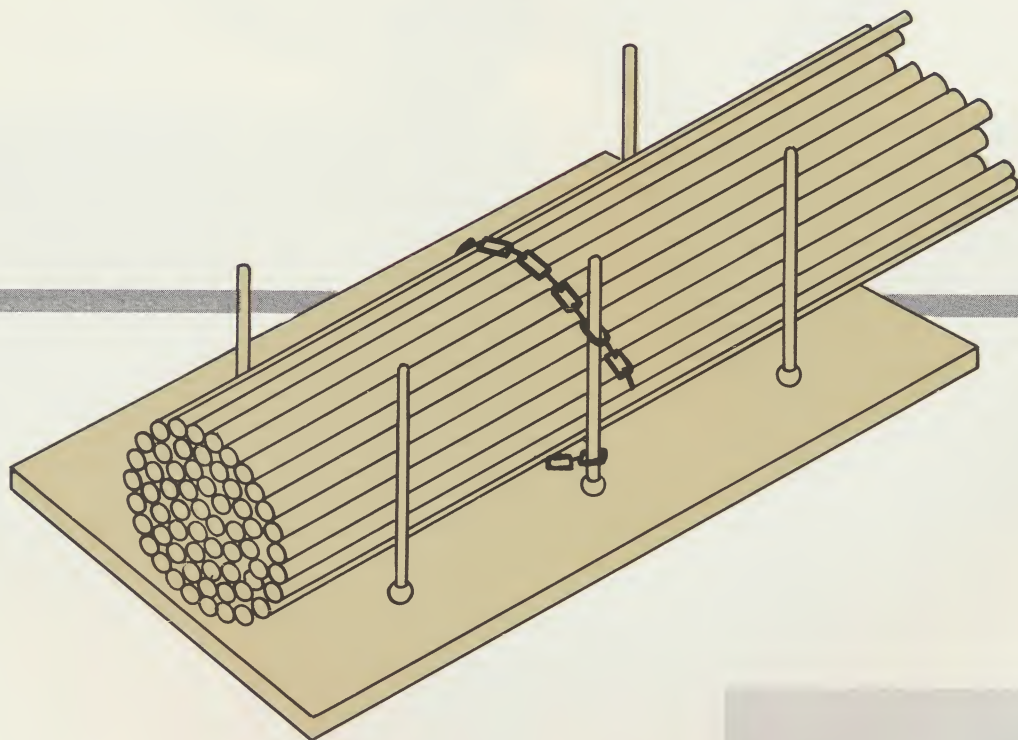
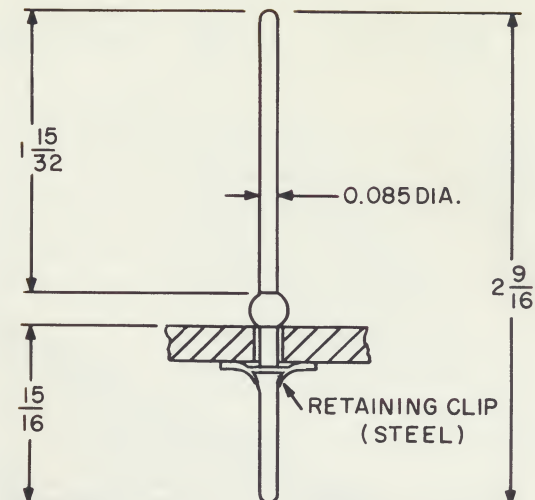
**SHOE HORN WT-184** Slide the S-shaped shoe horn under the cable bundle. It is easy to slide the *TY-RAP* tie under and around the bundle by placing the *TY-RAP* tie in the channeled slot in the shoe horn. Then push the tie — it slides right around the cable, and the tail comes up so that it is easily grasped.



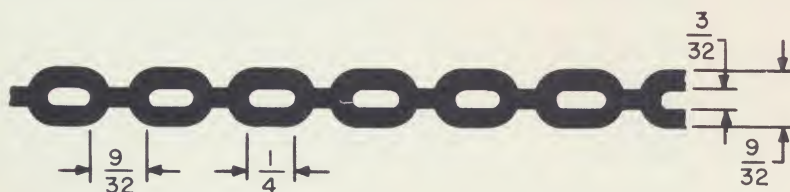
**STRAIGHT NAILS TC3-50, TC3-100, TC5-87, TC5-175** Position two metal nails opposite each other at a position where cable is to be tied. One of the nails, the one holding the head-end of the *TY-RAP* tie, should be as high as the expected cable diameter. The other nail can be longer. Next, position a *TY-RAP* tie in the channels. After all the wire has been routed, complete the tie with the *TY-RAP* tie. The result is a secure job facilitated by the *TY-RAP* nails which perform the dual function of positioning the cable and holding the *TY-RAP*.



**NYLON NAILS TC-57** Place the nylon nail in a drilled hole in the harness board, and fasten it from beneath by sliding a speed nut along the shaft of the nail until it meets the underside of the harness board. The result is that you have a nail firmly embedded in place that will not slip out, loosen, or damage cable insulation. Being flexible, the nylon nails can be pushed aside by the tying tool to provide greater access to the cable bundle during tying.

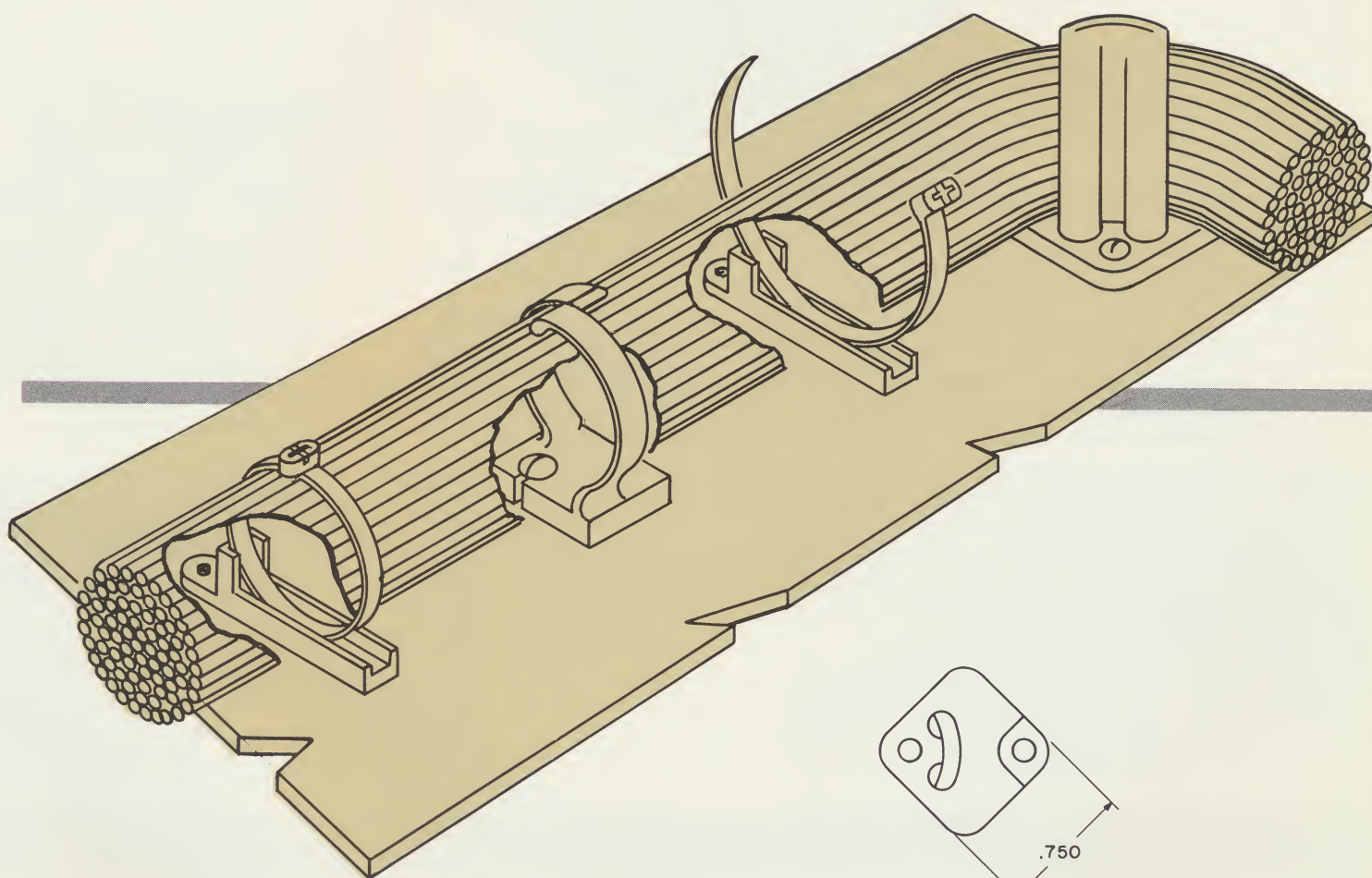
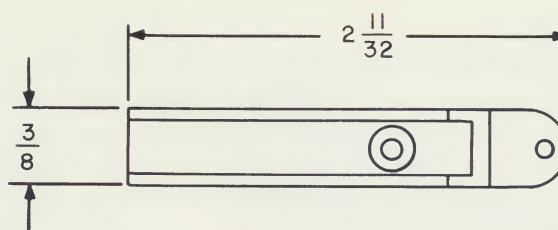


**TY-CHAIN TC-50** When used with the nails, the Ty-Chain becomes an ideal tool to hold wire in place until the harness is ready to be tied. Just loop the Ty-Chain over the nail before any wire is placed down; later, loop it back around the cable and over the same nail holding it.

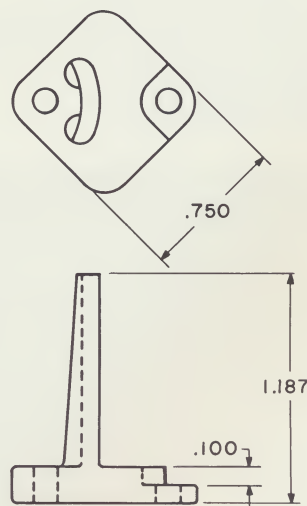




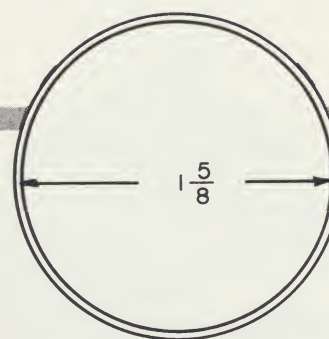
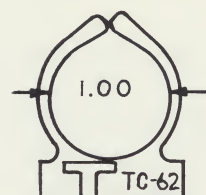
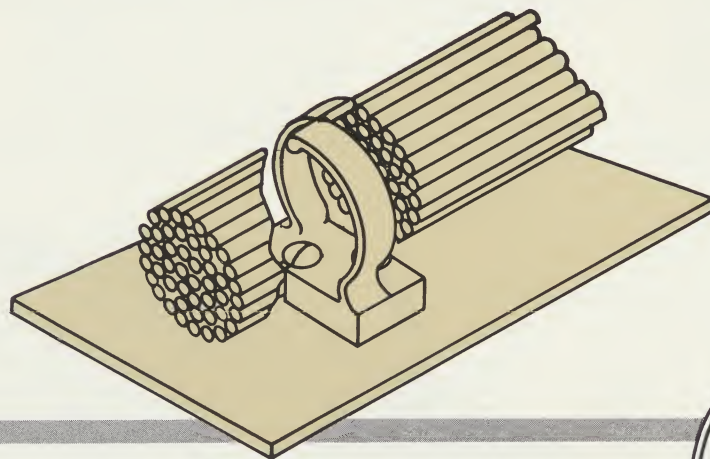
**PLASTIC CHUTE TC-60** The Plastic Chute permits the *TY-RAP* tie to be slipped under the cable after the wire has been positioned. Just place the Chute where a tie will be made, lay the cable, slide the *TY-RAP* tie under the cable, and complete the tie.



**CORNER POSTS TC-58** These posts gently guide the cable around corners in a smooth consistent arc. Molded of nylon, they have smooth edges which will not damage insulation of cable or harness bundle. They may be used singly or in multiples of two or four to obtain larger corners or large round post.



**BUNDLE RETAINERS TC-61, 62, 63, 64** Fasten the Bundle Retainer to the board and place each wire in it as it is brought past. The Bundle Retainer provides a positive means of holding the loose wires until they are tied. As the harness is raised from the board, it will snap out of the Bundle Retainer. Available in 1/2", 1", 1 1/2", 2" diameters.



**HELICAL RINGS TC-55, 56** These spring steel Rings may be used in conjunction with Mounting Bases TC-101 and TC-103 which are pre-mounted at strategic points. The Rings are fed through the slots of the Bases, and the wires are simply popped into the Rings by the person doing the wiring. When the bundle is completed, the Rings are removed and replaced with *TY-RAP* ties.

By using the Rings, manufacturers find they no longer need to use channel — an expensive, involved method of wiring and cabling.

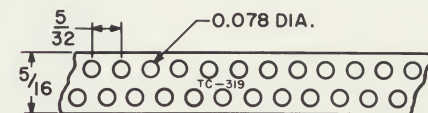
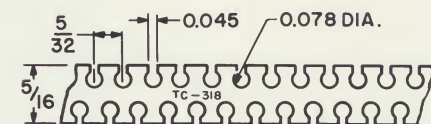
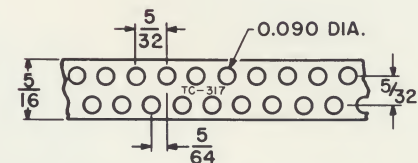
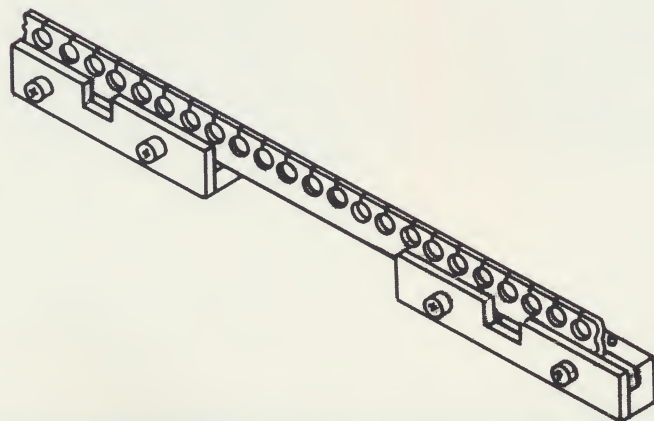
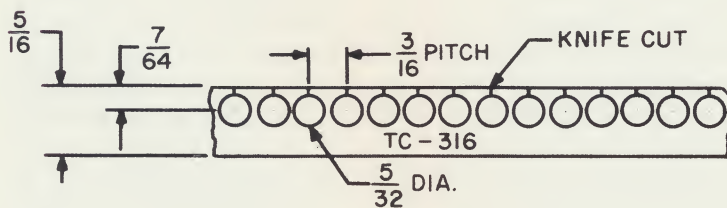
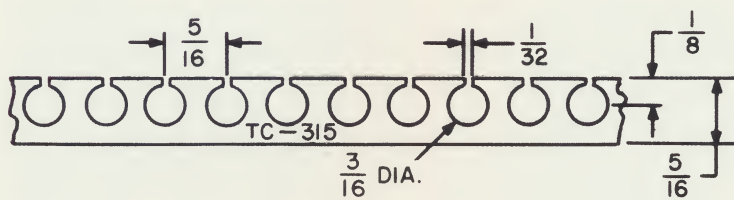
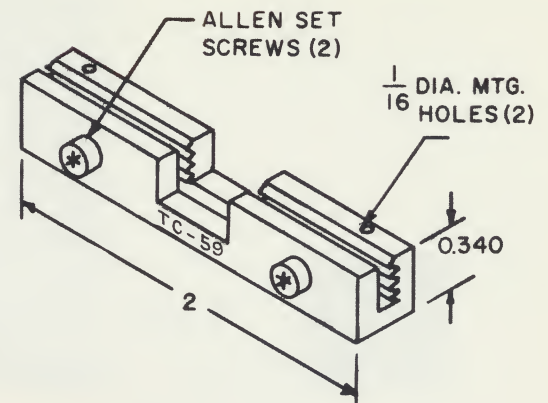


## HARNESS AIDS

CAT. NO	DESCRIPTION	LENGTH	WIDTH	BUNDLE RANGE	REMARKS
TC3-50	Metal Nail	1/2"	1/4"	—	Use with TY-3 tie
TC3-100	Metal Nail	1"	1/4"	—	Use with TY-3 tie
TC5-87	Metal Nail	7/8"	—	—	Use with TY-5 tie
TC5-175	Metal Nail	1-3/4"	—	—	Use with TY-5 tie
TC-60	Chute	1-5/8"	1/2"	—	Nylon
TC-57	Nylon Nail	2-9/16"	.085" dia.	—	Nylon
TC-50	Ty-Chain	50' coils	9/32"	—	.050" thk. Neoprene
TC-61	Retainer	1/2" dia.	1/2"	1/2"	Nylon
TC-62	Retainer	1" dia.	3/4"	1"	Nylon
TC-63	Retainer	1-1/2" dia.	1"	1-1/2"	Nylon
TC-64	Retainer	2" dia.	1-1/4"	2"	Nylon
TC-58	Corner Post	1-3/16"	3/4"	—	Nylon
TC-55	Ring	1-5/8" dia.	3/16"	1-1/2"	Use with TC-101 Mount
TC-56	Ring	2-13/16" dia.	5/16"	2-1/2"	Use with TC-103 Mount
WT-184	Shoehorn	3-3/4"	1/2"	—	For TY-5 width ties



**BREAKOUT STRIPS TC-315, 316, 317, 318, 319 AND HOLDER TC-59** Available in nylon or polyethylene, T&B breakout strips are THE answer to isolating a large number of conductors from each other as they are brought out of a cable. Just mount the breakout strip to the harness board using T&B Breakout Strip Clamps. As each wire is brought from the cable, place it in the proper slot or hole (Breakout Strips can be obtained with slots or holes). Then, spot several *TY-RAP* ties at key points. Five standard styles of Breakout Strips are presently available. These, and other special configurations, can be obtained with numbered breakout holes and slots. Please contact your T&B representative concerning these specials.



### BREAKOUT STRIPS

CAT. NO.	HOLE DIAMETER	HOLE SPACING	WIDTH	THICKNESS	SLOT WIDTH	SINGLE ROW	DOUBLE ROW	MATERIAL
TC315N	3/16"	5/16"	5/16"	.062"	1/32"	X	—	Nylon
TC315P	3/16"	5/16"	5/16"	.062"	1/32"	X	—	Polyethylene
TC316N	5/32"	3/16"	5/16"	.062"	Knife-Cut	X	—	Nylon
TC316P	5/32"	3/16"	5/16"	.062"	Knife-Cut	X	—	Polyethylene
TC317N	.090"	5/32"	5/16"	.040"	—	—	X	Nylon
TC317P	.090"	5/32"	5/16"	.040"	—	—	X	Polyethylene
TC318N	.078"	5/32"	5/16"	.042"	.045"	—	X	Nylon
TC318P	.078"	5/32"	5/16"	.042"	.045"	—	X	Polyethylene
TC319N	.078"	5/32"	5/16"	.042"	—	—	X	Nylon
TC319P	.078"	5/32"	5/16"	.042"	—	—	X	Polyethylene
TC-59	Breakout strip holder — mounts to harness board							Aluminum

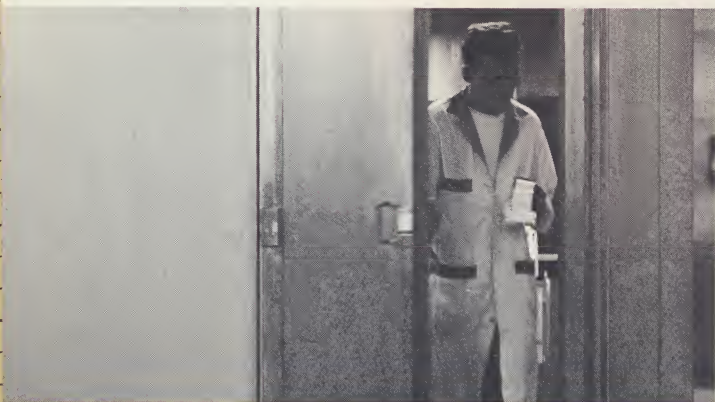




## THE THOMAS & BETTS CO.

Since 1895, T&B engineering has been guided by the need for originality. Over the years, T&B has originated a large number of new products, many of them standard within the industry today. Just a few of the more recent T&B pioneered products enjoying wide acceptance include: liquid-tight raceway connectors, flat conductor cable connectors, the TY-RAP cable tying system, compression connectors for extra-high-voltage transmission lines, as well as many prototype solderless connection techniques which have since become standard in the electrical and electronic industries.

T&B engineers have also participated throughout the years in the development of industrial standards of quality and safety. Since the formation of NEMA, The National Electrical Manufacturers Association, T&B people have helped form and lead committees to develop and raise many industry standards. Other industrial participation has included work on the Aircraft Electrical Systems Committee of the Society of Automotive Engineers, the Committee on Electrical Raceways and Fittings of the American Standards Association, consultation on transmission and distribution products with the Edison Electrical Institute, and continuing membership in the Institute of Electrical and Electronic Engineers. For many years, T&B engineers have worked closely with government specification writing agencies such as General Services Administration and the Joint Army and Navy Committee on Military Standards for Electrical Connections.



THE SHIELDED ROOM ELIMINATES OUTSIDE ELECTRICAL INTERFERENCE AND PERMITS EXACTING ELECTRICAL TESTS TO BE PERFORMED.



ENGINEERING FACILITIES INCLUDE THIS TY-RAP TIE AND ACCESSORIES DESIGN GROUP.





AN AERIAL VIEW OF  
THE THOMAS & BETTS CO.

Thomas & Betts has followed a consistent pattern of product development and market growth that is probably unique in the electrical industry. No single company competes with T&B across the product line.

T&B product designs have been guided strictly by their ability to connect, tap, terminate, fasten, ground, support or protect electrical wires and raceways. Today, of course, wires and raceways are installed wherever electricity produces light, heat or power in homes, buildings, ships, machinery, and in vehicles on the land and in the air. T&B products go along with these wires and raceways into the same diverse markets. This philosophy is one of the consistent ways of doing business that Thomas & Betts feels have been responsible for equally consistent good results.

The Thomas & Betts Company is unique in its method of marketing — all distribution is through authorized electrical/electronic distributors. This system is beneficial to both you and T&B. The local T&B salesman is your on-the-spot technical source and back-up for the distributor. The distributor handles all paperwork, schedules your shipments from the T&B factory, provides local emergency stocks, and represents T&B on a daily basis. We elect to pay the distributor for services that we believe he performs more economically than we can. The result is strong continuity of service to you the user of T&B products.



SHAKER TABLE SUBJECTS TY-RAP TIES TO EXTREME PHYSICAL ABUSE.



THE CLIMATE CONTROLLED DATA PROCESSING  
CENTER HAS IMPROVED EFFICIENCY  
OF CUSTOMER SERVICE.





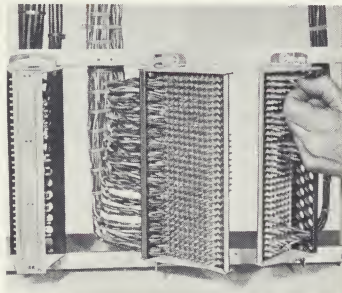
## Other T&B products for evaluation

### CONNECTION SYSTEMS AND CABLING TECHNIQUES



#### CONNECTO-BLOK® WIRING SYSTEM

NEW BLOCK AVAILABLE FOR SNAP-ON TERMINALS OR WIRE WRAP



The Connecto-Blok is a flexible wiring system for audio, video, control, and high-density circuits. This terminal block saves on board assembly, rewiring costs and space. The Connecto-Blok provides greater reliability than a soldered terminal board plus the flexibility of a multi-pin type connector in one compact device.

Matching .110 terminals accommodate No. 24 — No. 18 AWG stranded wire. Flash-over — up to 4200 volts, pin-to-pin. Mounting arrangement accommodates a heavy

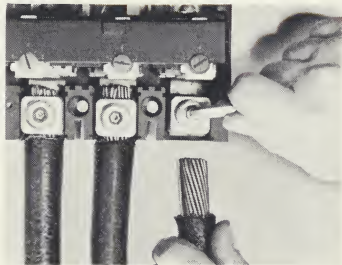
concentration of plug-in connections — 4800 or more — in rack space height of only 10½". Savings in wiring costs of 20% have been reported — 40% savings have been recorded through the use of high-speed strip terminal attaching machines.



Write for technical bulletin T21-225A.



#### REDDY® LUGS FOR COPPER AND ALUMINUM CABLE



T&B Reddy lugs resolve the basic difference of thermal expansion rate and oxidation between copper and aluminum. The lug and screw are made from aluminum alloys which have compatible thermal expansion rates. A special tin plate formula eliminates electrolytic corrosion. Switch, panel board and electrical equipment manufacturers using these lugs permits their equipment to accept either copper or aluminum conductors. The high pressure wedge effect of the screw

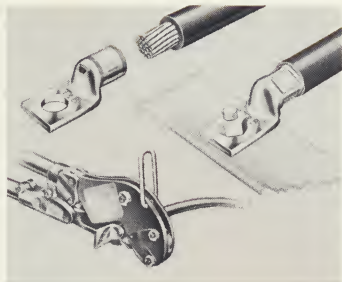
system provides positive interstrand contact, abrades conductor oxides and assures a low resistance connection. There is an extensive selection of styles and ampere range — 15 AMPS to 1600 AMPS. Each lug is capable of handling a wide range of wire sizes. Standard hex wrenches are the only tools required for installation.



Write for technical bulletin C10-242.

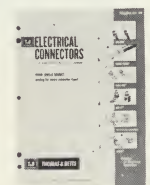


#### COLOR-KEYED® CONNECTORS AND LOCK-TITE® LUGS



For use on code copper, flexible copper and aluminum cable, Color-Keyed® compression connectors are used to terminate, tap, pigtail and splice in the wire range #8 to 1000 MCM. This line of connectors costs up to 50% less than other type connectors in this range. Savings on installation are also achieved with T&B's color key method. Color bands on the connectors match corresponding colors on the installing tool dies to eliminate guesswork and speed installation. Each connection is permanent, electrically

efficient — less resistance than an equal length of the conductor. Hand and hydraulic installing tools cover the complete installation range. Lock-Tite® lugs are available in many styles and variety of tongue shapes for use on all copper cables. No tools are required for these pressure type connectors—install with a screwdriver, adjustable or socket wrench.

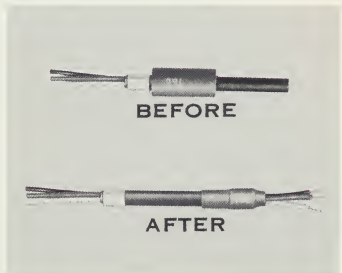


Write for technical bulletin C15.



#### NEW IRRADIATED HEAT SHRINKABLE INSULATORS

QUICK, CLEAN, MOISTURE-TIGHT INSULATION IN SECONDS.



T&B's color-coded heat-shrinkable insulators are made of irradiated polyolefin tube which shrinks at 275°F. and immediately conforms to the shape of the product being insulated. Ideal for insulating terminals, taper pins, splices, connectors and components. The calibrated shrinking of the insulator provides a tight fit and gives excellent strain relief at flex points.

The tubing is available in lengths from ½" to 3¾" and from .125" to .625" dia.

(shrink ID .063 to .312). Dielectric strength of 1000 volts/mil., and a tensile strength of 3000 psi.

A special low-cost heat gun is available which supplies fast heat evenly distributed in seconds.



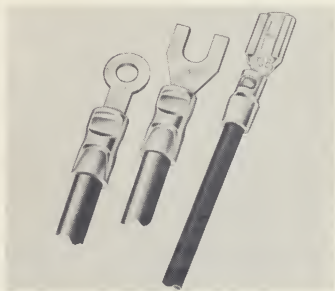
Write for technical bulletin T11-159.





## STA-KON® SOLDERLESS TERMINALS AND CONNECTORS

NEW WT-145A HAND TOOL - THE ONLY TOOL THAT CONFORMS TO MIL SPECS. AND INSTALLS INSULATED TERMINALS, SPLICES AND END CAPS ON NO. 26 - NO. 10 WIRE.

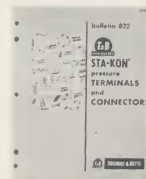


An extensive line of insulated and non-insulated tin-plated copper terminals, dis-connects, end caps, wire joints and special terminals. Available with Teflon®, Nylon® and PVC insulation. Wire range from #26 to 250 mcm. Stud sizes #0 to 3/4". High-temperature (2000°F.) terminals are also available. Meet MIL-T-7928 and are UL and CSA listed where applicable.

The STA-KON WT-145A is the only tool that conforms to military specifications for installing insulated (TYPE II) Class I

terminals, per MIL-T-7928, MS-25036-1A. It replaces 3 tools. It is the smallest, lightest, most economical and easiest - to - squeeze tool. Weighs only 24 ozs. and can be held easily with one hand.

Write for complete technical information.



## MIL TYPE SPLICES AND MULTI-SPLICES

NEW TECHNIQUE SAVES SPACE . . . ELIMINATES TERMINAL STRIPS



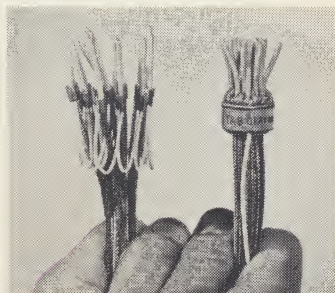
This line meets MIL-T-7928. It has found wide acceptance in the electronic and aerospace industries. Permits splicing of multi-conductors anywhere in the wire bundle. It is a compact, self-contained junction, completely insulated, provides extended flex protection. Inspection window gives reliability check. These connectors operate over a wide temperature range. The insulation material is nylon (Zytel®). When compared to other methods the multi-splice system offers weight and space savings, reduced

installation costs, less noise interference and elimination of moisture and fungus traps. The line accommodates wire sizes from No. 10 to No. 26. All sizes can be installed with only one tool - WT-145A. SEE STA-KON solderless terminals for tool features.

Write for complete technical information.



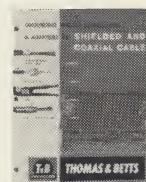
## NEW CONNECTOR GROUNDS ALL CONDUCTORS OF SHIELDED CABLE SIMULTANEOUSLY



T&B's new Shield-Kon® connectors offer users an easy, quick and reliable system for grounding multiple-conductor shielded cable. One compression grounds all wires - eliminates individual connections and daisy chained jumpers. Reduces installed costs - less installation and inspection time. The system utilizes a hard brass inner ring and a soft copper outer ring. Ground wire or wires and shielded braids are positioned between the two rings. One stroke of the tool and a 360° compression uniformly

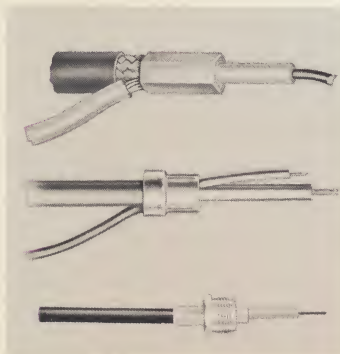
grounds all wires in a noise-free connection. These Shield-Kon connectors are also available with a rugged nylon insulator ring which protects conductor insulation from abrasion.

For complete information write for Bulletin T60



## SOLDERLESS COAXIAL GROUNDING CONNECTORS & R. F. ADAPTERS

NEW COMPRESSION TECHNIQUE REDUCES NOISE



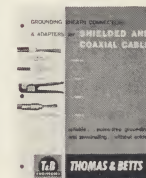
A permanent hex-compression method for reliable grounding termination and insulation of shielded and coaxial cable at lower installed costs. Provides a noise-free, solderless, secure connection without damage to insulation or measurable change in impedance. Mechanically, the bond is stronger than the braid.

T & B has designed a line of R. F. Adapters which are pre-matched to fit widely used coaxial cables to specified R. F. Connectors. They provide a complete, secure, threaded joint in addition to the advantages of the hex-compression. These adapters lower inventory and tool requirements which make

them particularly attractive to users of coaxial cable.

A wide selection of sizes in several connector styles are available for the complete range of shielded cable. Standard and special types for every need - non-insulated, flared, self-insulated, half-length and special high temperature, to 500°F, inner and outer sleeves. T & B flag type for special applications is also available. Hand and power tools are available.

Write for technical bulletin T60.







The items contained in this catalog are available in stock at your local authorized T&B distributor. For more information, contact your T&B distributor or district sales office listed below.

## district sales offices

### CALIFORNIA

145 S. Anderson Street  
Los Angeles 54, California  
ANgelus 8-3191

23 North Broderick Rd.  
Burlingame, California  
692-2323

### COLORADO

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Denver, Colorado  
292-6900

### GEORGIA

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Atlanta 25, Georgia  
799-8508

### ILLINOIS

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Elk Grove Village, Illinois 60007  
439-3100

### KENTUCKY

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Louisville 7, Kentucky  
JUDson 3-5518

### MASSACHUSETTS

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Braintree, Mass.  
843-0373

### MICHIGAN

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Detroit 21, Michigan  
UNiversity 4-5077

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VICTor 2-0337

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St. Louis, Missouri  
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BARclay 7-8644

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888-0245

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WALnut 2-4236

3413 Babcock Boulevard  
Pittsburgh, Pennsylvania  
931-1203

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P.O. Box 6445  
Houston 6, Texas  
JACKson 81610

### WASHINGTON

2207 First Avenue  
Seattle 4, Washington  
MAIn 3-0357

### WISCONSIN

4920 W. Vliet Street  
Milwaukee 8, Wisconsin  
GREENfield 6-7470

## in canada

### THOMAS & BETTS LTD.

P. O. Box 10  
Iberville, Quebec

### Ontario

Toronto, 548 King Street West

### Atlantic Provinces

Saint John, N. B.—Rothsay at East-  
mount, P.O. Box 1375  
Dartmouth (Halifax), N. S. P. O. Box 153

### British Columbia

Vancouver, 1539 West Third Avenue

### Prairie Provinces

Winnipeg, Manitoba, 357 Bannantyne  
Avenue  
Calgary, Alberta, 3628 Burnsland Road

### Quebec

Montreal, 751 Victoria Square

### INTERNATIONAL DIVISION

#### Headquarters

Thomas & Betts Co., Inc.  
International Division  
206 Industrial Center  
Princeton, New Jersey

#### Europe

Thomas & Betts S. A.  
52 Rue Du Progres  
Brussels 1, Belgium

**THE THOMAS & BETTS CO. ELIZABETH, NEW JERSEY**

INCORPORATED

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